

# Instruction Book

**MONROE**

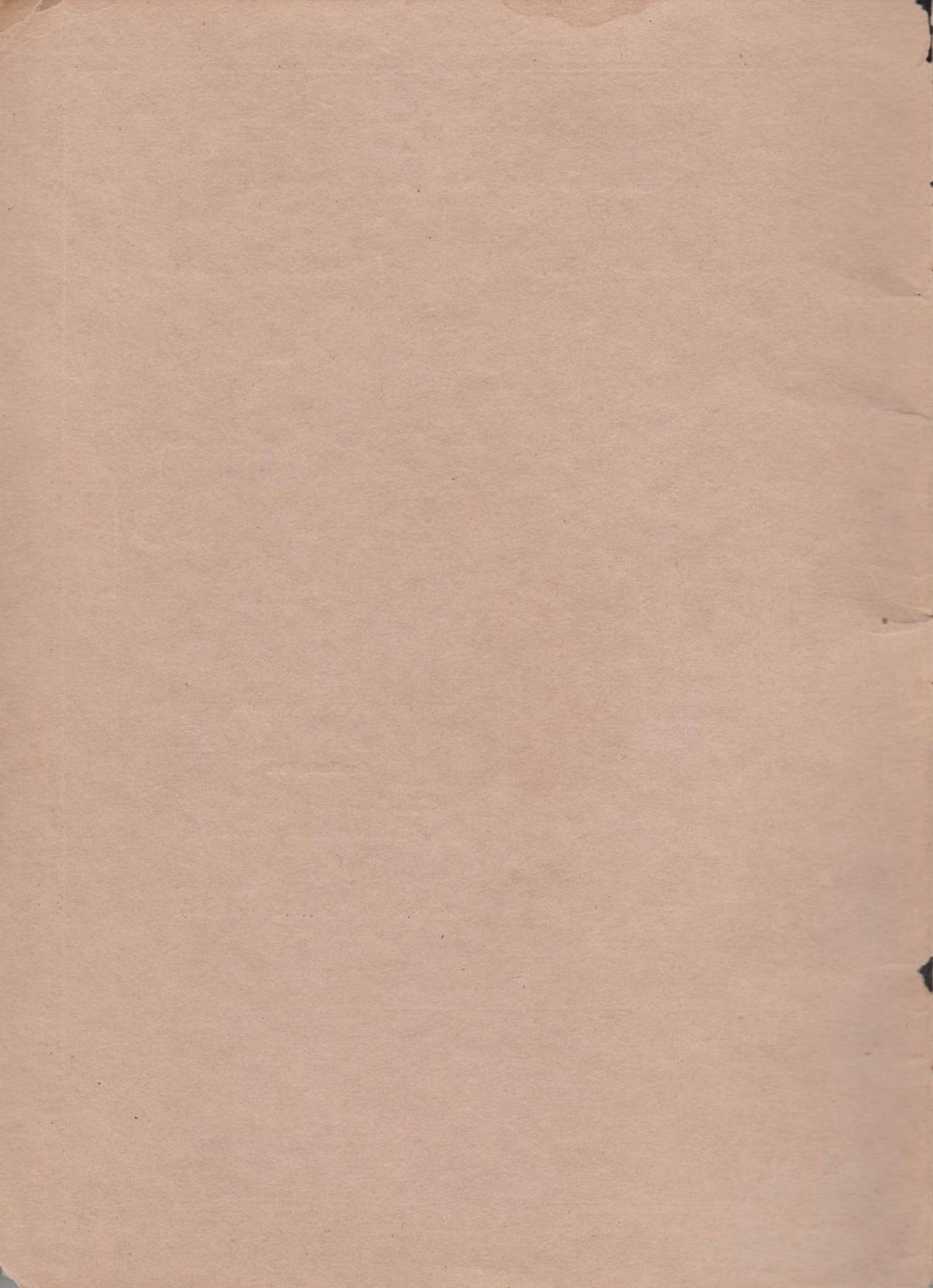
Reg. Trade Mark

**Calculating  
Machine**

MONROE CALCULATING MACHINE CO.

*General Offices — Woolworth Bldg. New York*

*Plant at Orange N.J.*



3-159  
46<sup>00</sup>

# INSTRUCTION BOOK

OF THE



## CALCULATING MACHINE

### *Foreword*

The purpose of this book is to give information which will enable the operator to use the Monroe Machine to the best advantage and for the greatest variety of work.

Examples have been given showing the wide range of the Monroe and its efficient application to all modern office calculations.

The instructions given are extremely simple, and are intended to enable the beginner, who may never have used an adding or calculating machine of any kind, to add, subtract, multiply, divide and work out the ordinary commercial problems without other assistance.

Monroe Calculating Machine Company

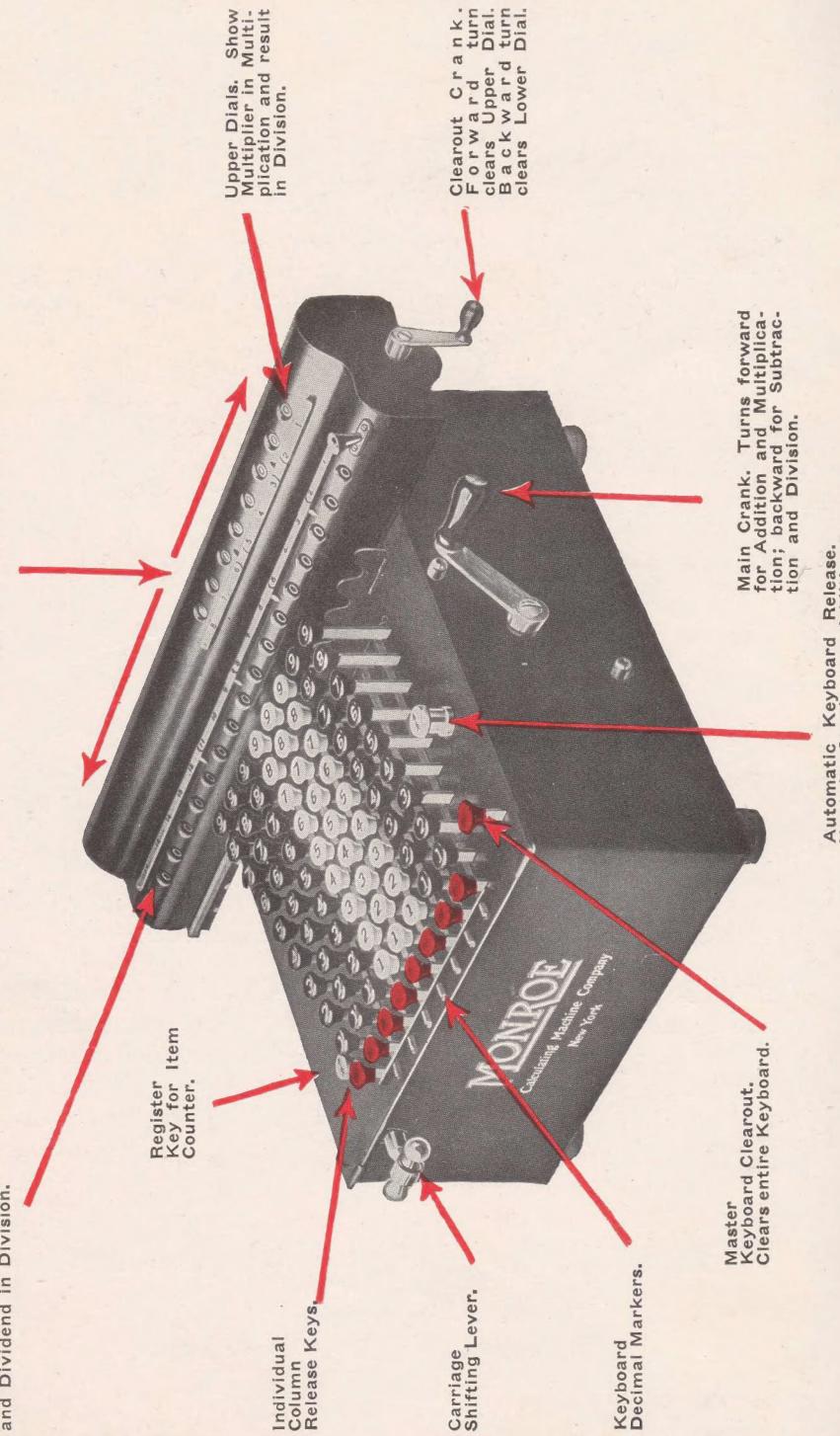
General Offices:

Woolworth Building, New York City

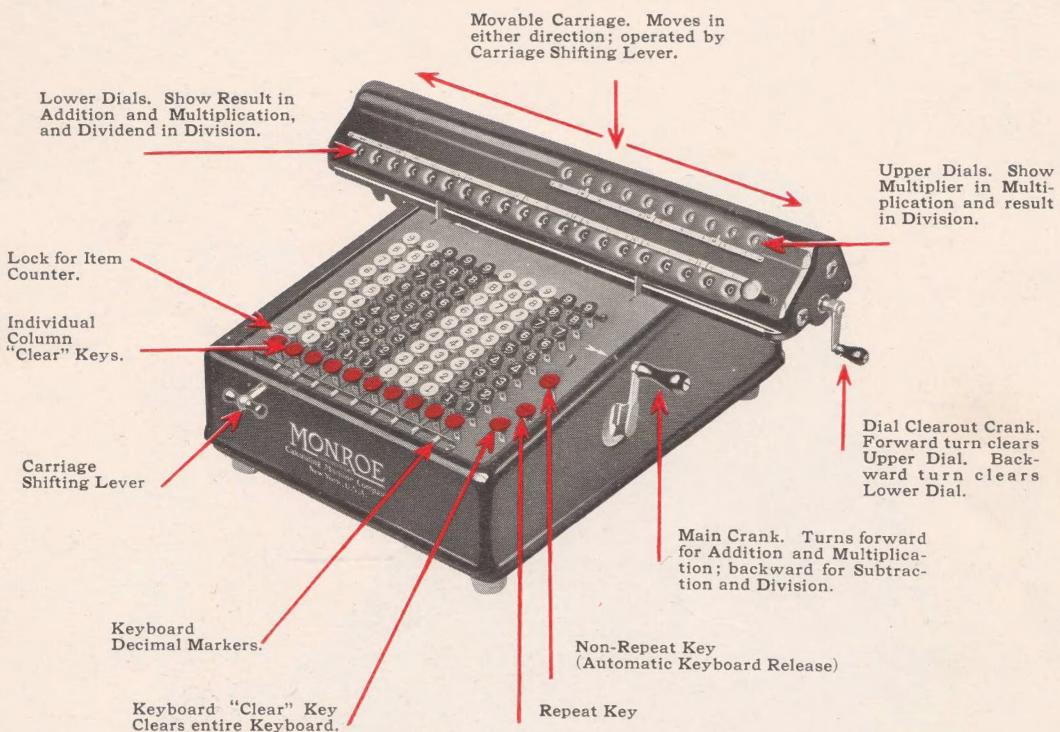
# The Model G Monroe

Lower Dials. Show Result in Addition and Multiplication, and Dividend in Division.

Movable Carriage. Moves in either direction; operated by Carriage Shifting Lever.



# The Model K Monroe



## Features of Operation

The Model K Monroe has many improved mechanical and operating features which make it a superior calculating machine.

The description of the various parts and their operation beginning on page 5, and the instructions, cover specifically the Model G Monroe (as well as prior models). The Model G Monroe is illustrated on the opposite page.

Note carefully the following points of difference and the instructions apply equally well to either machine. For example, where reference is made to setting the "Automatic Release Key with the arrow pointing to the right" it will be understood to mean, when using the Model K, depress the "Non-Repeat Key."

### The Operating Crank.

Faster and easier operation is made possible by the change from two stopping positions to one in the Model K. This stopping point is indicated by an arrow on the keyboard but the crank may be brought to rest anywhere within a quarter turn beyond the point either on the forward or backward turn. The crank operation of the Model K is very easy to grasp for this reason.

### Automatic Keyboard Release.

The "Repeat" and "Non-Repeat" keys of the Model K take the place of the Automatic Keyboard Release referred to in the instructions.

Depressing the Repeat Key releases the Non-Repeat Key and has the same effect as setting the Automatic Keyboard Release with the arrow pointing away from the operator. The Non-Repeat key is used when the instructions refer to setting the key with the arrow pointing to the right.

### The Dial Clearout.

A forward turn of the Dial Clearout Crank clears the Upper Dial, a reverse turn clears the Lower Dial. However in the Model G Monroe it is also necessary to raise the carriage with the Carriage Shifting Lever to clear the Lower Dial.

# The Model K Has Many Improved Features

**Capacity** The New Monroe is made in three sizes, 20-place, 16-place and 12-place. From this range may be selected a machine which will answer any figuring purpose. The perfect calculating and adding machine for any business, large or small.



**Keyboard** The Keyboard is sloped at the natural angle and the key stems are of uniform height, making it easy to span a set-up. A light touch of the fingers on the keys places the numbers on the keyboard. With minimum effort, half the problem is done.

**Appearance** The appearance of the New K Model Monroe presents lines of symmetry and beauty. The machine case and the carriage case are aluminum castings handsomely designed and finished with great care, making it a smart-looking machine. The background under the keys is an enameled green which is restful to the eye.

**Speed with Accuracy and Visible Proof** Every feature of the K Model Monroe is conducive to speed with accuracy. The keytouch is light and the stroke short; the crank motion is

**The Dial Clearout** When the work is done and the answer noted, no time is wasted in the clearout. Simply a reverse turn of the small clearout crank raises the carriage and clears the dials simultaneously. A forward turn clears the upper dials.

**Operating Crank** The finish of either a forward or backward turn is at the same point. This ONE-STOP crank is a feature of great importance.

Moreover the next item may be set on the key-board or the carriage shifted even though the crank be turned as much as a quarter turn past the stopping point. This leeway is a feature of advantage possessed by no other machine. It means freedom and simplicity of operation, and with the smooth, easy crank movement, promotes speed in every type of work.

## Repeat and Non-Repeat Keys

The operating parts of the Monroe are few and simple. The Repeat key is depressed when it is desired to retain numbers on the keyboard, the Non-Repeat Key when it is desired to release them at each turn of the crank.

fast and smooth; the key and dial numbers are large, conveniently placed and easily read; mechanical locks eliminate errors. These with the simple, flexible Two-way Mechanism and Visible Proof mean Speed with *absolute accuracy*.

## PART I

### Describing the Various Parts of the Machine and Their Operation

#### Operation of the Main Crank.

*Note.—While the operation of the Monroe Machine is quite simple and easy to learn, it is exceedingly important that this paragraph on the operation of the Main Crank be read very carefully by the beginner or by the operator accustomed to other types of machines.*

*It will be readily appreciated that the mechanical movements will come easily after a little practice, though in many instances they will not come so easily to operators accustomed to the movements of other machines as they will to the beginner.*

*It is with this thought in mind that we have gone into what may be considered unnecessary detail in explaining the operation of the Main Crank. A few minutes practice in the manner described will make the operation very easy.*

The Main Crank operates in either direction, forward or clockwise, for addition and multiplication, backward or counter-clockwise for subtraction and division. There are two stopping places, after a forward turn stop at the Upper Position, after a backward turn stop at the Lower Position as explained below. The Crank is equipped with automatic locks in order to provide against operating errors which might otherwise result if the turn is not ended at the proper position.

Probably the most important step for the beginner to learn is to turn the Main Crank properly. This will come easily if the operator will practice a little so as to become accustomed to the proper stopping places. Take hold of the Crank firmly with the thumb and first two fingers of the right hand and using a quick wrist movement with the elbow resting on the desk make one complete turn forward or "clockwise" stopping at the Upper Position opposite the small nickeled indicator. The operator will hear a slight click at this point. This is the position at which the Crank must always be stopped after a forward turn or a series of forward turns.

If in turning the Crank forward you run by the Upper Position, the Carriage will be locked so that it cannot be shifted, and the Crank cannot be turned backward. This arrangement of locks makes operating errors impossible. All that need be done if the Crank or Carriage

is locked is to complete the turn forward and be sure to stop at the Upper Position, thus releasing the locks. From this position the Crank may be turned backward a turn and a half to the Lower Position to wipe out the last operation if desired. When the Crank is turned backward always stop at the Lower Position, at the nickeled indicator directly opposite the Upper Position. Running by the Lower Position also locks the Crank and Carriage and the full turn must be completed in the same way stopping at the Lower Position before the Crank can be reversed.

Practice making several forward turns stopping on the last turn at the Upper Position. **Do not run by.** Now reverse the motion and turn the Crank backward several turns stopping at the Lower Position just opposite the Upper Position. Remember that the forward turn always ends at the Upper Position, and the backward turn always ends at the Lower Position. After a little practice with the Crank the operator will not realize that there are any locks on the machine except to recognize that they are safety devices which absolutely prevent operating errors.

#### Neutral Position of Main Crank.

After a complete turn in either direction to the starting point (the Upper Position for a forward turn, the Lower Position for a reverse turn) the half turn backward from the Upper Position or forward from the Lower Position is neutral and can be made without affecting any of the figures in the machine.

#### Monroe Standard Visible and Flexible Keyboard.

The Monroe Keyboard is constructed so that the Keys are locked and numbers cannot be depressed or released when the Main Crank is not in its proper position. If the Keys are locked, turn the Main Crank to either the Upper or Lower Position. This locking of the Keys when the Main Crank is not in its proper position or during its operation, is another feature of the Monroe which makes it absolutely proof against operating errors.

The depression of the Keys enables the operator to read the amounts as they are set up—an error may be detected and corrected immediately by simply depressing the proper Key. This operation automatically restores the Key which has been incorrectly depressed in the same column.

Considerable time is gained in setting up amounts by depressing two or more Keys at once in such items as 333, 545, 456, etc.

### **Keyboard Decimal Markers.**

When setting up amounts involving decimals, an arbitrary decimal point may be marked between adjacent columns of Keys by turning up the white side of the Keyboard Decimal Marker between the required columns.

To further assist the eye, a color arrangement of the Keys is used. The two black columns at the right represent cents, the three white columns, units, tens and hundreds of dollars.

### **Keyboard Release Keys.**

The Red Individual Column Release Keys are provided to clear any column of the Keyboard without disturbing the "setup" in other columns.

The Red Master Keyboard Release Key at the right clears the entire Keyboard.

### **The Automatic Release Key.**

When using the machine for addition or subtraction, set the Automatic Keyboard Release Key at the right of the Keyboard so that the arrow points toward the right. The Keyboard will then be automatically cleared at each revolution of the Crank. When using the machine for multiplication or division, the arrow on the Automatic Release Key should point away from the operator. In that position the turning of the Crank will not clear the Keyboard.

### **Register Key (Item Counter).**

The Register Key at the left of the Keyboard may be used to count the number of items added when making a series of additions or in short multiplication, as described on page 21.

To set the Item Counter, depress the figure 1 on the Keyboard at the extreme left and turn the Register Key until the arrow points to the right. This operation latches the Number 1 Key and holds it securely until released by turning the Register Key back to the left. When the Number 1 Key is locked in this way every turn of the Crank is counted in the Lower Dial immediately above the last column at the left of the Keyboard, thus serving as an item counter when desired.

### **The Carriage and Carriage Shifting Lever**

The Carriage at the top of the machine carries the Result Dials. It may be instantly shifted to the left or right as desired by a half turn of the Carriage Shifting Lever. If it is desired to shift the Carriage

a number of spaces, it may be raised with the hand and moved the number of spaces required.

#### **The Carriage Lock.**

The Small Plunger at the left of the machine acts as a safety lock on the Carriage so that it cannot be raised or shifted during an operation or when the Crank is in any position other than the Upper, Lower or Neutral Position. This prevents operating errors that might be made by shifting the carriage at the wrong time.

#### **Upper and Lower Dials.**

The Dials in the Carriage show the results. In adding, the totals show in the Lower Dial. In multiplication the number to be multiplied or the multiplicand is set up on the Keyboard. As the Crank is turned, the multiplier is registered in the Upper Dial and the result or product in the Lower Dial.

#### **Clearing the Dials.**

Before beginning any operation, both rows of Dials in the Carriage should be clear, that is, they should show zeros only. If figures other than zeros appear in these Dials, clear them out by raising the Carriage with a quarter turn of the Carriage Shifting Lever toward the right, using the left hand. While the Carriage is thus raised, turn the Clearout Crank a complete turn toward the operator to the bottom of the turn to clear the Lower Dial, then a complete turn away from the operator to clear the Upper Dial. If it is desired to clear the Upper Dial alone, the Carriage need not be raised. Always complete the revolution of the Clearout Crank **to the Bottom of the turn** before reversing it, otherwise, it will lock on the reverse turn.

## Describing the Simpler Operations, Addition, Subtraction, Multiplication and Division

### Addition.

Example:  $325 + 456 + 222 = 1003$

Though addition may be accomplished with the Carriage in any position, it is best when performing the simpler operations to have the Carriage shifted to the left as far as it will go, as shown in Figure 1.

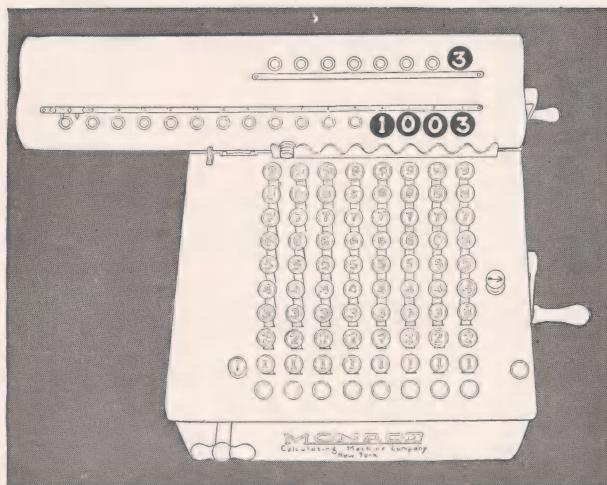


Figure 1.

Set the Automatic Release Key with the arrow pointing to the right. See that the Dials are clear as explained on page 8. Set 325 on the Keyboard at the right and turn the Crank forward a full turn to the Upper Position registering 325 in the Lower Dial. Do not turn the Crank past the Upper Position. If you do you will lock the keys as previously explained and another forward revolution of the Crank will have to be completed before the next number can be set up. Set 456 on the Keyboard and turn the Crank forward again; this adds 456 to 325. Set 222 on the Keyboard, turn the Crank forward once more, registering the result 1003 in the Lower Dial as shown in Figure 1.

### Subtraction.

On the Monroe, subtraction is a direct operation; simply turn the Crank backward instead of forward as in addition.

Example:  $1003 - 445 = 558$

At the end of the preceding example 1003 appears in the Lower Dial; to subtract 445 from it simply set 445 on the Keyboard, turn the Crank backward a turn and a half to the Lower Position and the answer, 558, appears in the Lower Dial.

In taking off a trial balance you can add your debits at the right in the Lower Dial, your credits at the left in the Lower Dial, shifting the Carriage over if necessary, set the credits on the Keyboard under the debits as they appear in the Lower Dial and subtract them without clearing the machine.

If the subtraction produces a "minus" result, as for instance an overdraft in a bank, the same is automatically indicated by the ring of a bell and by turning up a row of nines at the left in the Lower Dial.

### Multiplication.

The operation of multiplication on the Monroe is as simple as addition.

Example:  $4346 \times 122 = 530212$

Set up 4346 on the Keyboard, as shown in Figure 2.

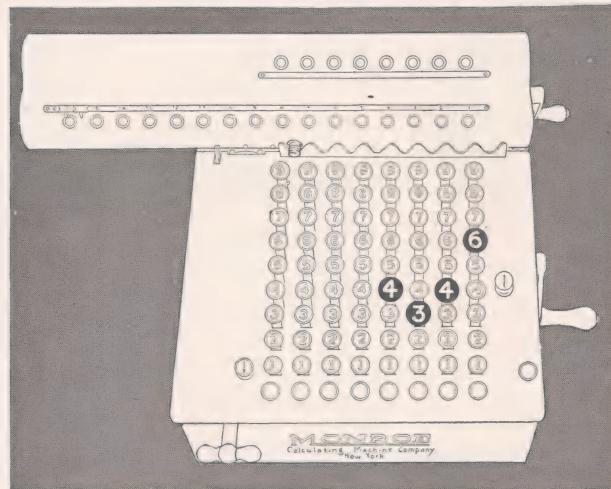
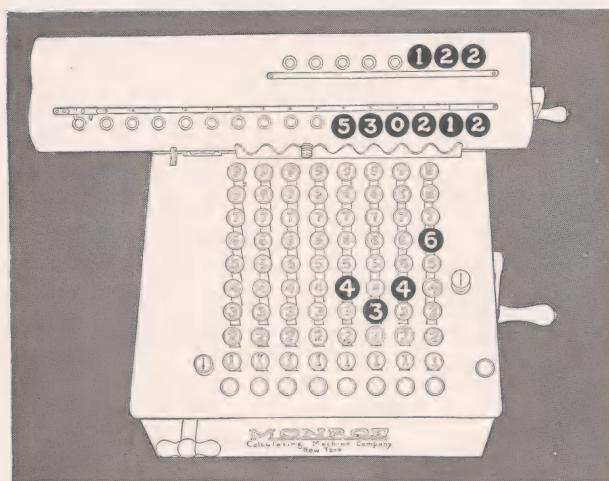


Figure 2.

See that the arrow on the Automatic Release Key points away from the operator.

Turn the Crank forward two turns, stopping at the Upper Position. Do not run by the Stopping Point. With the Carriage Shifting Lever shift the Carriage one position to the right and make two more turns. Shift Carriage again and make one turn. The Keyboard and Dials are now in the position shown by Figure 3.



**Figure 3.**

The three successive steps you have taken in the multiplication register in the Result Dials as follows:

1st Step	2nd Step	3rd Step	
00000002	00000022	00000122	Upper Dial
00000008692	000095612	00000530212	Lower Dial
00004346	00004346	00004346	Keyboard

The multiplicand 4346 remains in the Keyboard throughout all steps. For anyone familiar with the machine the whole operation requires two seconds or less.

Notice as you are performing these operations that the Multiplier always registers in the Upper Dial directly above the first column on the Keyboard. Keep this in mind as it is this point that determines how the Carriage must be shifted in order to register the digits of the Multiplier in their proper positions.

### Proof.

Here is illustrated the self-checking feature of the Monroe machine. Observe that at the end of the operation the multiplier shows in the Upper Dial, the multiplicand in the Keyboard and the result in the Lower Dial. If it is discovered that the wrong number of turns have been made at any step it shows in the Upper Dial and may be immediately corrected by either a forward or a backward turn of the Crank, without doing the problem over again.

### Changing the Multiplier.

Suppose you wish to change the multiplier from one number to another, leaving the multiplicand 4346 constant on the Keyboard. For instance, having multiplied by 122, you wish now to multiply by 312. Do not begin over again but simply change the 1 to a 3 and the next 2 to a 1, by turning the Crank forward twice and backward once in the proper positions. As you do this, the result in the Lower Dial changes correspondingly. The result in the machine will then stand as follows:

00000312	Upper Dial
0001355952	Lower Dial
00004346	Keyboard

The entire operation is extremely simple; it requires no expert knowledge, skill or training, and you know your result is absolutely accurate, because all the numbers you have used are visible in the machine.

Multiplication on the Monroe may be performed in either direction. For example, in the above multiplication you may begin as explained by multiplying with the 2 units in the multiplier, shifting the Carriage to the right to put in the 2 tens and the 1 hundred or you may begin by turning in the 1 hundred in the 3rd position in the Upper Dial and then shift the Carriage to the left to turn in the 2 tens and the 2 units. The result will be the same in either case.

### Division.

On the Monroe, division is performed with the same ease, simplicity and directness as multiplication. As multiplication is a process of continued additions and is accomplished by turning the Crank forward, so division is a process of continued subtractions and is accomplished by turning the Crank backward.

Example:  $477591 \div 224 = 2132$ ; remainder 23

Set the dividend 477591 in the Keyboard and by one turn of the Crank forward register it in the Lower Dial. See Figure 4. Clear the Upper Dial and the Keyboard, set the divisor, 224, in the Keyboard and shift the Carriage 3 spaces to the right so as to bring the divisor 224 directly under the 477 of the dividend the first position for dividing. The status of the machine at this point is illustrated by Figure 4.

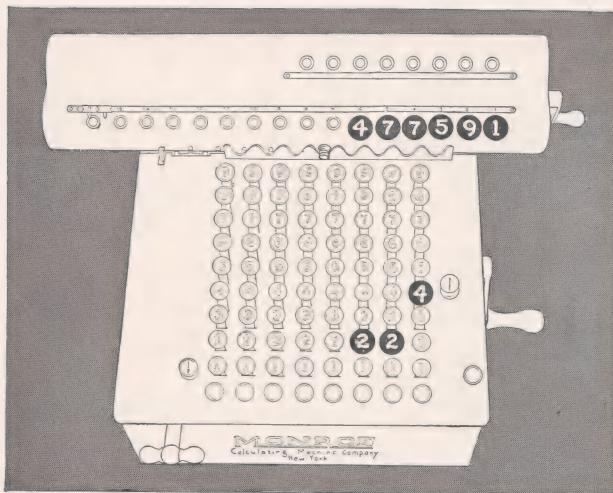


Figure 4.

Turn the Crank backward, subtracting 224 from the first three figures of dividend (477) as many times as it can be subtracted, that is twice. The red 2 in the Upper Dial indicates the first figure of the result, as shown under 1st Step below.

Shift the Carriage one space to the left, again subtract the 224 as many times as possible from the three figures of the dividend that appear immediately above it, that is, once. See 2nd Step. Continue this shifting and subtracting until no further subtraction can be made.

The figures as they show up on the machine at the end of each step are as follows:

1st Step	2nd Step	3rd Step	Last Step	Upper Dial	Lower Dial
00002000	00002100	00002130	00002132		
0000029591	000007191	000000471	000000023		
00000224	00000224	00000224	00000224	Keyboard	

The condition of the machine at this point is shown in Figure 5. The divisor, 224, remains constant in the Keyboard. At the last step the number appearing in red in the Upper Dial 2132, is the result (quotient); the number in the Lower Dial, 23, is the remainder. See Figure 5.

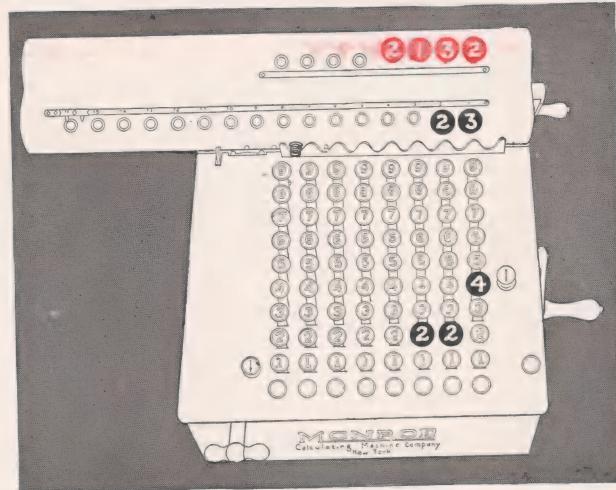


Figure 5.

The whole operation requires but three or four seconds. If at any stage of the division too many backward turns of the Crank are made, a row of 9's is brought up at the left of the dividend and a bell rings, instantly indicating the extra turn. To correct this, merely turn the Crank forward, bringing all the figures back just as they were before the extra turn was made, again the bell rings, indicating that the correction has been made.

## The Use of Decimals and Rules for Pointing Off

### Multiplication of Decimals.

In most accounting work and particularly in work as it is handled by the different kinds of adding and calculating machines, errors in pointing off decimals are not only numerous but are even more serious than errors in figures. The arrangement of the Dials and the Keyboard in the Monroe machine makes it particularly efficient in the handling of calculations involving decimals. The use of "fixed" decimal points is strongly recommended for all work of this kind. By the use of fixed decimal points we reduce the whole matter of multiplying decimals to one simple rule, the ordinary arithmetical rule for handling decimals, that is, mark off as many places in the result as there are places in the other two factors together.

On the Monroe machine in multiplication the Result Dial is the Lower Dial and the two factors are shown in the Upper Dial and the Keyboard, respectively. Hence our rule as applied to the Monroe machine for multiplication of decimals would be as follows:

First having determined from the given factors the number of decimal places that must be provided for, fix the decimal points on the Keyboard and in the Upper Dial with a sufficient number of places to accommodate those factors. Then fix the decimal place in the Lower Dial at the sum of the places as they have been fixed on the Upper Dial and Keyboard. Always keep this **balance** in decimal places.

Remember it as a formula for decimal points as follows:

$$\text{Upper Dial} + \text{Keyboard} = \text{Lower Dial}.$$

That is, the sum of the decimal places in the Upper Dial and the Keyboard no matter what it may be, must always show in the Lower Dial and you can never go wrong.

Then proceed with the multiplication, being careful to set the multiplicand on the Keyboard with proper relation to the Keyboard decimal point as it has been fixed, shift the Carriage if necessary, to such a position that when the multiplier is being turned into the Upper Dial it will be registered in the proper relation to the Upper Dial decimal point as it has been previously fixed. We can then be sure without question that the result as it appears in the Lower Dial will be properly pointed off by the fixed decimal point which has already been established on that dial.

For example:  $20.125 \times .425 = 8.553125$

In this problem the largest number 20.125 or the multiplicand, is to be set up on the Keyboard. This means that we must mark off three decimal places on the Keyboard to accommodate it, turning up a white marker between the third and fourth columns of Keys. The .425 is to be turned into the Upper Dial, we must, therefore, point off three places in the Upper Dial to accommodate the multiplier. We now have three places pointed off in the Keyboard and three places pointed off in the Upper Dial. We must, therefore, fix the Decimal Slide on the Lower Dial at the sum of three and three or six places.

Set up the 20.125 on the Keyboard with proper relation to the keyboard decimal point, shift the Carriage as may be necessary and turn the Crank so as to register the 5, the 2 and the 4 of the multiplier in the Upper Dial in the proper relation to the fixed decimal point which has been established there. The result will then show as in Figure 6.

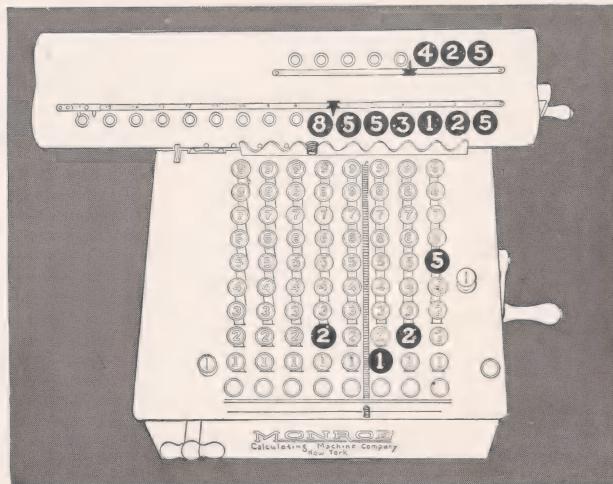


Figure 6.

#### Division of Decimals.

In division the same principle of pointing off applies. That is, the sum of the decimal places in the Upper Dial and the Keyboard must always show in the Lower Dial.

Take this example:  $22.868 \div 6.7 = 3.4131$

Quotient desired to four decimal places. Since the quotient is going to be shown in the Upper Dial and is to be carried out to four decimal places, we start out by fixing the decimal point in the Upper Dial with four places to the right.

The divisor, 6.7, is going to be set up on the Keyboard. Therefore, we need to use but one decimal place on the Keyboard.

Suppose, however, that we decide to leave the decimal place fixed on the Keyboard at the same place it was in the previous problem, that is, with three places to the right so as to accommodate any divisor containing from one to three decimal places. This means that having the decimal point fixed at four places in the Upper Dial and three places in the Keyboard, it must be placed at the sum of four and three, or seven places in the Lower Dial.

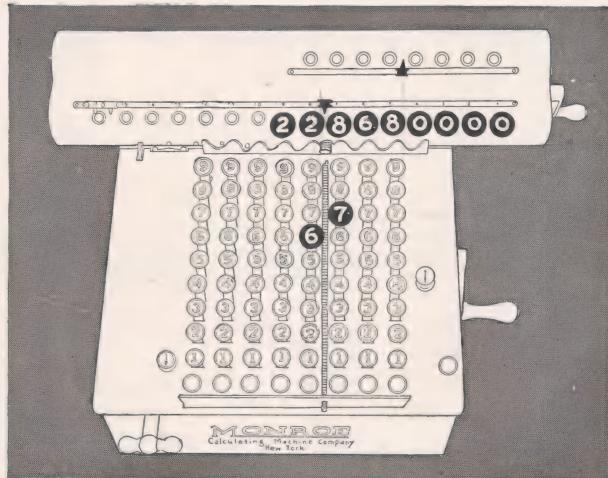


Figure 7.

We must now get the dividend into the Lower Dial. To do this, set the dividend 22.868 on the Keyboard and turn it into the Lower Dial with the Main Crank so that it shows in the Lower Dial properly pointed off as shown in Figure 7.

As you turn in the dividend you register a 1 in the Upper Dial.

Always clear this 1 from the Upper Dial before proceeding with the division. Set 6.700 on the Keyboard and shift the Carriage to the proper position for the first subtraction, see Figure 7.

Continue the operation as in simple division previously explained by turning the Crank backward and shifting the Carriage toward the left.

As the result is being registered in red in the Upper Dial it will automatically register with proper relation to the decimal point which was previously fixed and the final result will show as in Figure 8.

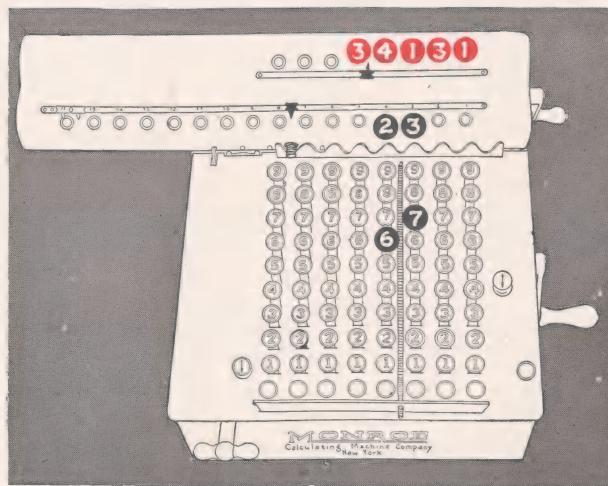


Figure 8.

The .0002300 shown in the Lower Dial is the remainder.

Take another example:  $20.621 \div 6.41356 = 3.21521$

Quotient in this example to be carried out to five decimal places. This means we must point off five places in the Upper Dial as that is the place where the quotient is going to appear. Since the divisor, 6.41356, must be set up on the Keyboard, we must mark off five places on the Keyboard. Now with 5 places in the Upper Dial and 5 places on the Keyboard, we must point off the sum, or 10 places in the Lower Dial.

Set 20.621 on the Keyboard, turn it into the Lower Dial in the proper place with regard to the decimal point as shown in Figure 9. Clear the Keyboard and don't forget to clear out the 1 in the Upper

Dial after turning in the dividend. Set 6.41356 on the Keyboard as indicated and shift the Carriage to the proper position to start the division as shown in Figure 9.

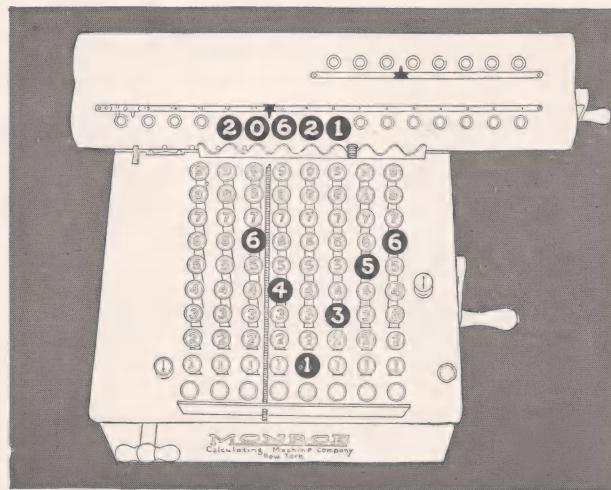


Figure 9.

Proceed with the division in the regular way, showing the final result as in Figure 10.

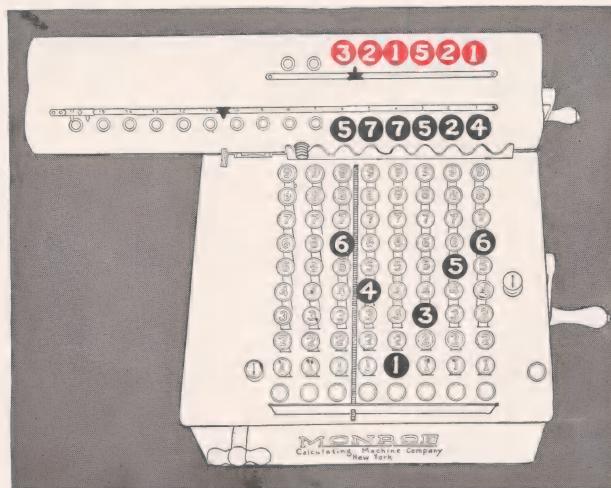


Figure 10.

## PART II

### Special Problems and Rules for Simplifying and Shortening Certain Operations

The simplicity of the machine and the reversibility of every feature makes it readily adaptable to a number of short cuts in the various operations of multiplication and division depending upon the character of the particular problems. We are giving herewith some of these rules. Others of a special nature, depending upon the character of the work that is being done, will be quickly picked up by the operator, or will be suggested, upon request, by the Monroe Systems Service Department.

#### Short Multiplications Using Lower Dial Only.

For short multiplications involving not more than seven figures in the result, that is, multiplying four figures by three figures or five figures by two figures, the multiplier may be shown in the Lower Dial to the left of the result. This is of considerable advantage, as it enables the operator to clear out both the product and the multiplier which appear in the Lower Dial, with a single throw of the Clearout Crank, disregarding entirely the figures in the Upper Dial.

Before beginning the multiplication depress the Item Counter, that is, the number 1 key in the last column to the left of the Keyboard, and "lock" it by turning the Register Key a half turn with the arrow pointing toward the right so that the number 1 Key will not be released when the Keyboard is cleared. When this has been done the multiplier will be registered in the Lower Dial at the left of the product as the Crank is turned. The multiplier at the left may be separated from the result at the right by placing a decimal indicator between the seventh and eighth positions on the Lower Dial.

#### Shortening Multiplication by Reversing the Crank.

When the multiplier is a number ending in 7's, 8's, or 9's, as for example, 39, 198 or 997, the multiplication may be accomplished by a combination of forward and backward turns, reducing considerably the number of turns required by the regular method.

Example:  $2146 \times 198 = 424908$

Set 2146 in the Keyboard, shift the Carriage two places to the right and turn the Main Crank forward twice. In other words, multiply 2146 by 200. Then shift the Carriage back two spaces to its original position and turn the Main Crank backward two turns, taking off two in the units column. The answer 424,908 will then show in the Lower Dial to the right, the multiplier 200 less 2 in the Upper Dial and the actual multiplier, 198, to the left in the Lower Dial if the Register Key has been left depressed as explained on page 20. See Figure 11.

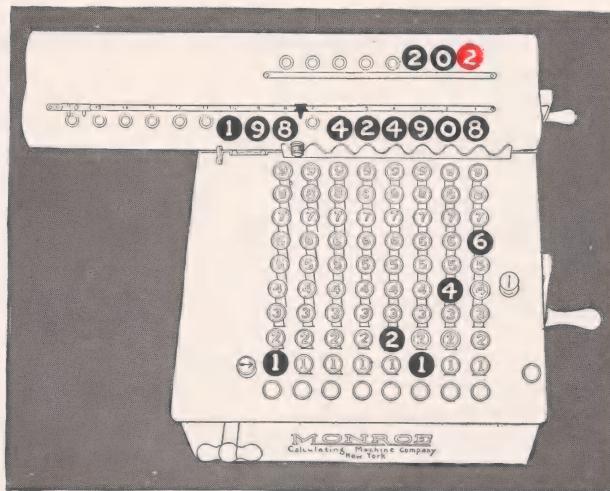


Figure 11.

The operator should practice this method of shortening all multiplications. For example instead of multiplying by 88, multiply by 100 and take off 12, shown in Upper Dial thus: 12.

Instead of multiplying by 2192 show it in the Upper Dial thus—  
2 2 1 2. A little practice will enable the operator to become quite proficient in picking out short equivalents like the following:

283 shown in Upper Dial as 3 2 3

827 shown in Upper Dial as 1 2 3 3

2791 shown in Upper Dial as 3 2 1 1

5987 shown in Upper Dial as 6 0 1 3

## Taking Off Discounts—Chain Discounts

Example: 456 lbs. of Copper Wire at \$0.22½ per lb. less 50—10—5.

Mark off three decimal places Upper Dial.

Mark off two decimal places Keyboard.

Mark off five decimal places Lower Dial.

Set 456.00 on the Keyboard and multiply by .225, starting with 5 and shifting Carriage toward the right, getting a result in the Lower Dial of 102.60000. The dials read:

0 0 0 0 0.2 2 5	Upper Dial
0 0 0 0 1 0 2.6 0 0 0 0	Lower Dial

0 0 0 4 5 6.0 0	Keyboard
-----------------	----------

Clear Upper Dial and Keyboard.

Set the product 102.60 on the Keyboard and subtract five times by reverse turns of the Crank, registering the 5 in the correct position in the Upper Dial.

Dials now read:

0 0 0 0 0.5 0 0	Upper Dial
0 0 0 5 1.3 0 0 0 0	Lower Dial (showing 50% off.)

0 0 0 1 0 2.6 0	Keyboard
-----------------	----------

Clear Upper Dial and Keyboard.

Set 51.30 on Keyboard and subtract once, registering .100 in Upper Dial, 46.17000 appears in Lower Dial, showing 50% and 10% off.

The Dials now read:

0 0 0 0 0.1 0 0	Upper Dial
0 0 0 4 6.1 7 0 0 0	Lower Dial (Showing 50-10 off.)

0 0 0 0 5 1.3 0	Keyboard
-----------------	----------

Clear Upper Dial and Keyboard.

Set the 46.17 on Keyboard, shift Carriage to the left and take off the 5% by subtracting 5 times, showing .050 in Upper Dial. Final result reads:

0 0 0 0 0.0	5 0	Upper Dial
0 0 0 0 4 3.8	6 1 5 0	Lower Dial (showing 50, 10, 5 off)

0 0 0 0 4 6.1 7	Keyboard
-----------------	----------

\$43.86 therefore represents total cost \$102.60 less 50—10—5.

#### Use of Tables for Chain Discounts.

When there is any considerable work to be done in taking off chain discounts, it is, of course, advisable to use a table, which may be easily prepared, showing the equivalents of the discounts most frequently used in a particular class of work. Such tables designed especially for the Monroe Calculating Machine are given on pages 46 and 47 or they will be furnished printed on cardboard upon application to the Company.

For example the equivalent of 50—10—5 off is .5725 off and the equivalent of 100% less .5725 is .4275. So that knowing this equivalent in the above example the same result may be obtained by simply multiplying the total cost 102.60 by .4275.

The Discount Equivalent Tables are worked out to five decimal places. Consequently, if the numbers that are being discounted consist of less than five digits, considerable time may be saved by setting the discount equivalent on the Keyboard and multiplying by the number to be discounted.

Example: The list price of a certain metal is \$6.50 per cwt. less 50—10—10—5. What is the net price?

Set the equivalent, .38475, taken from Table No. VIII, page 47, on the Keyboard and multiply it by 6.50, showing the 6.50 in the Upper Dial. Read the answer, 2.50, in the Lower Dial.

If the number to be discounted is larger than five digits, the shortest method is to set this number on the Keyboard and multiply by the Discount Equivalent.

## Accumulative Multiplication

In accumulative multiplication, that is, when two numbers are multiplied together, and the product multiplied by a third number and that product multiplied by a fourth number and so on, the following method should be used:

Example:  $32\frac{1}{2} \times 168 \times 13\frac{1}{2} \times 154 =$

Handle the fractions as decimal fractions.

Mark off 2 decimal places Upper Dial.

Mark off 2 decimal places Keyboard.

Mark off 4 decimal places Lower Dial.

Set 168.00 on the Keyboard and multiply by 32.5.

5460 appears in the Lower Dial thus:

0 0 0 0 3 . 2 . 5 0	Upper Dial
0 0 0 0 5 4 6 0 . 0 0 0 0	Lower Dial

0 0 0 1 6 8 . 0 0	Keyboard
-------------------	----------

Clear the Upper Dial and Keyboard.

Set 5460.00 on Keyboard—multiply by 12.5 (one whole number less than 13.5) as we already have the multiplicand once in the Lower Dial, meaning that it has been multiplied by 1.

After this operation has been performed the Dials will read:

0 0 0 0 1 2 . 5 0	Upper Dial
0 0 7 3 7 1 0 . 0 0 0 0	Lower Dial

0 0 5 4 6 0 . 0 0	Keyboard
-------------------	----------

Set 7371.00 on the Keyboard. Clear the Upper Dial. As we have 7371 once in the Lower Dial, multiply by 153—one less than 154.

Final result:

0 0 0 1 5 3 . 0 0	Upper Dial
0 0 1 1 3 5 1 3 4 0 . 0 0 0 0	Lower Dial

0 7 3 7 1 0 . 0 0	Keyboard
-------------------	----------

In transferring an amount from the Lower Dial to the Keyboard, if the amounts are large, it is well after setting them up on the Keyboard to subtract them out from the Lower Dial as a check before going on with the work. If the amount has been correctly set up on the Keyboard zeros only will appear in the Lower Dial after the subtraction. This safeguard prevents transposition and other errors of operation.

#### Correcting Figures in the Lower Dial.

If after a number is turned into the Lower Dial it is noticed that one or two figures are incorrect, it is not necessary to clear out the entire Lower Dial to make the correction. Simply set up the incorrect figures on the Keyboard, subtract them out and fill in with the correct figures. Much time in correcting errors may be saved in this way, another feature of Monroe efficiency.

### Short Cuts in Division

Example:  $21975 \div 5 = 4395$

Twenty-two turns of the Crank are required to divide by the regular method as previously explained. Instead of using the regular method of division, use the reciprocal method  $21975 \times 1/5$ , that is, multiply 21975 by .2 the reciprocal of 5.

0 0 0 0 0 0 0 .2	Upper Dial
0 0 0 0 0 4 3 9 5 .0	Lower Dial

0 0 0 2 1 9 7 5 .	Keyboard
-------------------	----------

This method gives the same result as would be obtained by the regular method of division and with only two turns of the Crank.

$174692 \div 25 = 6987.68$ . By regular division this requires 45 turns of the Crank. Multiply by the reciprocal of 25, *i. e.*, the decimal equivalent of  $1/25$  or .04 this gives the same result with only four turns.

Always use this method of division where simple, well-known reciprocals can be conveniently applied.

### Use of Reciprocals.

Reciprocals are used extensively in percentage work and in prorating. They also form the basis of decimal equivalent tables as used in payroll calculations, cost accounting and many other kinds of mathematical calculations.

The reciprocal of a number is 1 divided by that number. For example 1 divided by 5 gives the decimal equivalent .2 which we call the reciprocal of 5. Multiplying a number by .2 gives the same result that would have been secured by dividing that number by 5, because 5 and .2 are reciprocals. With the Monroe the finding of a reciprocal of any number is a simple problem in division.

Problem: Wanted the reciprocals of 12

144

2240 to 6 places of decimals.

Summary of Machine Operations:

Mark off six decimal places in Upper Dial.

Mark off six decimal places in Lower Dial.

Mark off no decimal places on Keyboard.

Set 1,000,000 in Lower Dial.

Set 12 on the Keyboard at the right.

12 divided into 1.0 0 0 0 0 0 gives the reciprocal in the Upper Dial .0 8 3 3 3 3

In the same way:

144 divided into 1.0 0 0 0 0 0 gives in the Upper Dial .0 0 6 9 4 4

2240 divided into 1.0 0 0 0 0 0 gives in the Upper Dial .0 0 0 4 4 6

To shorten this operation we need not put the 1 in the Lower Dial, neither need we consider the decimal point.

For example, divide 2240 into 0 0 0 0 0 0 using the extreme left of the Keyboard and the left of the Lower Dial. The first turn of the Crank backward will bring up a nine to the left thus (9776000). Ignore the nine in the Lower Dial to the left of the 2240 on the Keyboard and proceed with division as usual, working away from the nine. The reciprocal of 2240 is found to be .00044642+.

The rule which determines the decimal point in reciprocals is as follows:

"Prefix as many ciphers to the reciprocal as there are whole digits less one in the original number."

2240 requires .000

144      "      .00

12      "      .0

### Reciprocals Commonly Used.

Common reciprocals used in different lines of business which may be memorized if they are used frequently, are as follows:

Month of 28 days	.03571	144 (gross, or inches to sq. ft.)	.006944
Month of 29 days	.03448	240 pence to a pound	.004167
Month of 30 days	.03333	360 days to a year	.002778
Month of 31 days	.03226	365 days to a year	.00274
32 lbs. to a bushel	.03125	1728 cubic inches to a foot	.0005787
56 lbs. to a bushel	.01786	480 sheets to a ream	.002083
60 lbs. to a bushel	.01667	2240 lbs. to a gross ton	.0004464
12 (dozen)	.08333	2268 lbs. to a gr. ton sand	.0004409
16 (ozs. or 16ths)	.0625	5280 feet to a mile	.0001894

Tables of reciprocals 1—10,000 are published by various authors but their use with the Monroe is unnecessary as reciprocals can be run off on the machine more rapidly and accurately than they can be looked up in the tables.

### Examples on the Use of Reciprocals: Payroll Work.

At \$125.00 per month of 30 days, what is the rate per day and the total pay for 19 days.

Point off 6 decimal places Keyboard.

Point off 2 decimal places Upper Dial.

Point off 8 decimal places Lower Dial.

Set reciprocal of 30 (.033333) on the Keyboard.

Multiply the .033333 by \$125.00.

Result.

0 0 0 1 2 5 0 0	Upper Dial
0 0 0 4 .1 6 6 6 2 5 0 0	Lower Dial (rate per day)
0 0 0 3 3 3 3 3	Keyboard

Clear Keyboard and copy the 4.166600 from the Lower Dial to the Keyboard in the proper relation to the Keyboard decimal point. Clear the Upper Dial but do not stop to clear Lower Dial. Consider that as 4.1666 appears there it is already multiplied by 1. Therefore, multiply the 4.1666 by 18 (20 less 2) instead of 19 and read the result.

0 0 0 0 2 2.0 0	Upper Dial
0 7 9 .1 6 5 4 2 5 0 0	Lower Dial (total pay)
0 4 .1 6 6 6 0 0	Keyboard

## Figuring Interest

Interest may be Figured by the Ordinary Arithmetical Rule as Follows:

Multiply the principal by the rate, then multiply this total by the number of days and divide the total thus obtained by 360 or 365 as the case requires. There are, however, several shorter methods which should be learned by the operator engaged in working on interest and discount.

Figuring Interest by Two Operations, a Multiplication and a Division.

Rule: Multiply the principal by  $1/100$  of the number of days and divide by the figure corresponding to the given rate as shown in table No. II, page 41.

Example: 458.25 at 5% for 21 days.

Fix the decimal points at two places on the Keyboard.

Three places on the Upper Dial.

Five places on the Lower Dial.

Set 458.25 on the Keyboard, and multiply by  $1/100$  of the number of days, in this case by .21. Showing the result:

0 0 0 0 0 .2 1 0	Upper Dial
0 0 0 0 0 9 6 .2 3 2 5 0	Lower Dial
0 0 0 4 5 8 .2 5	Keyboard

Clear the Keyboard and the Upper Dial. Set 72 (from table No. II corresponding to 5%) on the Keyboard in its proper position with regard to the fixed decimal point, thus 72.00 and divide it into the number in the Lower Dial reading the answer 1.336 in red in the Upper Dial, as shown herewith:

0 0 0 0 1 .3 3 6	Upper Dial
0 0 0 0 0 0 .0 4 0 5 0	Lower Dial
0 0 0 0 7 2 .0 0	Keyboard

Note: For another method of figuring interest by simultaneous multiplication and division, see page 35.

## Pro-Rating (Railroad Accounting)

The total mileage of several divisions and the combined receipts of those divisions is given, it being required to obtain both the percentage due to each division and the amount due each division. (The figures in black are the given figures. The figures in red are the required figures as obtained by the operation.)

Example:

Division	Mileage	Total Receipts	Per Cent.	Amount to Each
A	423		.526775	\$5101.684
B	234		.291407	2822.204
C	146		.181818	1760.862
	<hr/> 803	\$9684.75	<hr/> 1.000000	\$9684.750

First add the mileage of the three divisions and obtain the total mileage 803. Then obtain the percentage due to each division; this may be done either by dividing the mileage in each division by 803 successively or by a shorter method as follows:

Obtain the reciprocal of 803 which is .00124533 (use method described on page 26). Leave this reciprocal in the Upper Dial until you copy it to the Keyboard.

Mark off 0 decimal places Upper Dial.

Mark off 8 decimal places Keyboard.

Mark off 8 decimal places Lower Dial.

Copy the .00124533 from the Upper Dial to the Keyboard. Clear the Upper Dial and multiply by 423, the mileage of Division A getting a result of .526775 percentage due A. By backward and forward turns of the Crank change the multiplier to 234 in the Upper Dial, getting .291407 in the Lower Dial the percentage due B. Again changing the multiplier in the Upper Dial to 146 we obtain a result of .181818 percentage due C.

Set these percentages down as they are obtained as shown in the fourth column above.

It is now required to pro-rate the total receipts 9684.75 in the ratio as shown by the percentages.

Mark off 6 decimal places Upper Dial.

Mark off 2 decimal places Keyboard.

Mark off 8 decimal places Lower Dial.

Set up 9684.75 on Keyboard, and using the percentages just found as multipliers turn them out in the Upper Dial, setting down the amount due each division as shown in the fifth column above.

After the last amount 1760.862 is obtained, leave it in the Lower Dial and add to it the other two amounts to check back to the total 9684.75, thus proving the work. In the problem as worked out, we have carried out the figures sufficiently to obtain the result correct to a cent. In many cases it is only necessary to obtain results correct to the nearest dollar; in the latter case the work may be considerably shortened by using only four decimal places in the percentage column instead of six places.

If it is required to find only the amounts due each division and not the percentages the work may be considerably shortened by the following method:

Find the receipts per mile by dividing the total receipts \$9684.75 by 803. This gives \$12.06071 as the receipts per mile. Set this up on the Keyboard as a constant and using the respective mileages as given in the first column as multipliers turn them out in the Upper Dial and obtain the amounts due each division directly as shown in the fifth column above.

### **Reverse Division, Building Up the Dividend**

This is a method which is particularly efficient in the division of large numbers. The divisor is set up on the Keyboard and the dividend is built up from it by forward turns of the Crank.

#### **Insurance Accounting.**

Example: Find the ratio of the surplus to the outstanding insurance when the surplus amounts to \$1,565,677 and the outstanding insurance \$76,868,467; result to be correct to the fourth decimal place.

The problem is to divide the surplus by the outstanding insurance to get the percentage which the former is of the latter. This could be done by the regular method of division, explained in Part I; however, the number of operations can be considerably reduced by setting up the number which is to be the divisor, 76,868,467, on the Keyboard and building up the dividend, 1,565,677, in the Lower Dial, by a series of forward turns of the Crank in the proper positions, reading the result of the division in black in the Upper Dial.

Set 76,868,467 on the Keyboard.

To insure the result being correct to the fourth decimal place, mark off 5 decimal places in the Upper Dial where the result is to be shown.

Mark off no decimal places on the Keyboard.

Mark off five places in the Lower Dial.

Use two of the other decimal indicators to the left of the fixed decimal point in the Lower Dial, between positions 8 and 9, and 11 and 12, respectively, dividing the Dials off into groups of three each, so as to assist the eye in locating the proper position to build up 1,565,677.00000.

Shift the Carriage so as to bring the first figure 7 of the 76,868,467 into the proper position for building up the 1,565,667 in its correct position with relation to the fixed decimal point in the Lower Dial, *i. e.*, under the eleventh position. Turn the Crank forward twice, showing:

0 0 0.0 2 0 0 0	Upper Dial
0 1.5 3 7,3 6 9.3 4 0 0 0	Lower Dial
7 6,8 6 8,4 6 7	

Keyboard

The number in the Lower Dial approximating, but less than the dividend which is being built up.

Shift the Carriage to the left. If we shift once and turn the Crank forward once in this position, we get a number which is larger than the required dividend. If we should inadvertently do this, turn the Crank backward to wipe out this last turn and shift the Carriage another space to the left. Turn the crank forward three times in this position, showing:

0 0 0.0 2 0 3 0	Upper Dial
1.5 6 0.4 2 9.8 8 0 1 0	Lower Dial
7 6,8 6 8,4 6 7	

Keyboard

The number in the Lower Dial approximates but is still less than the required dividend. Shift the Carriage another place to the left and turn the Crank forward six times showing:

0 0 0.0 2 0 3 6	Upper Dial
1.5 6 5.0 4 1.9 8 8 1 2	Lower Dial
7 6,8 6 8,4 6 7	

Keyboard

The number in the Lower Dial approximates but is still less than the required dividend. If another turn were made in this position the dividend we are building up would be larger than the required dividend. We, therefore read the result as shown in the Upper Dial .02036, or correct to the fourth decimal place it would be .0204.

In building up a dividend in this manner the operator must always keep below the required dividend; that is, whenever the number in the Lower Dial becomes larger than the required dividend the Crank should be reversed and the Carriage shifted into the next position. A little practice with this method will result in considerable saving of time; especially in divisions involving large numbers, or when using a constant dividend, or a constant divisor.

## Simultaneous Multiplication and Division

### Explaining the Principles.

Multiplication and division may be performed at the same time by building up the dividend at one end of the Lower Dial, using reverse division and multiplying the quotient, which is being obtained, by another number set up at the other side of the Keyboard.

As a simple example: 1728 pieces at \$0.26 per dozen.

Find number of dozen and total cost. For problems of this kind two sets of decimal points are required on the Keyboard and Lower Dial.

Mark off 2 decimal places Upper Dial.

Mark off 0 and 8 decimal places Keyboard.

Mark off 2 and 10 decimal places Lower Dial, to correspond to the two Keyboard decimal places plus the Upper Dial decimal place.

Set up at extreme right of Keyboard 12 (1st and 2nd columns).

Set up at extreme left of Keyboard .26 (7th and 8th columns).

Keyboard now reads .2 6 0 0 0 0 1 2.

Ignoring the .26 at the left, by forward turns of the Crank build up 1728.00 in the Lower Dial from the 12 in the Keyboard as explained under reverse division. At the completion of the operation the Dials will read:

0 0 0 1 4 4.0 0	Upper Dial
3 7.4 4 0 0 1 7 2 8.0 0	Lower Dial

.2 6 0 0 0 0 1 2	Keyboard
------------------	----------

The 144 obtained by the building up process of division represents the quotient or the number of dozens in 1728.

The \$37.44 represents the product of the  $144 \times .26$  at the other side of the Keyboard, or the total cost of the 144 dozen.

This method is practical when the numbers involved are not so large as to make the amounts built up in the Lower Dial run together.

#### The more Practical Method of Simultaneous Multiplication and Division—Using the Complement of the Divisor.

A more practical method and the method to be used for handling large numbers is to divide by using the complement of the divisor at the right of the Keyboard, prefixing one nine and setting up one less than the multiplier to the left of the nine.

(The complement of a number is the difference between that number and the next higher power of ten, thus the complement of 6 is 4, of 12 is 88, of 73 is 27, of 28 is 72, of 2142 is 7858, etc.) To obtain the complement of a number mentally, subtract the right hand digit from 10 and the others from 9.

Using the same example of 1728 pieces at \$0.26 per dozen.

Mark off 2 decimal places Upper Dial.

Mark off 0 and 5 decimal places Keyboard.

Mark off 2 and 7 decimal places Lower Dial to correspond to the two Keyboard decimal places plus the Upper Dial decimal place.

Turn the dividend 1728 into the Lower Dial in the proper position with regard to the decimal point, *i.e.*, 1728.00 and clear the Upper Dial.

Set up on Keyboard .25—9—88. Eighty-eight being the complement of 12.

The machine now reads:

0 0 0 0 0 0.0 0	Upper Dial
0 0 0.0 1 7 2 8.0 0	Lower Dial

0 0 0.2 5 9 8 8	Keyboard
-----------------	----------

To the immediate left of 88 is the connecting nine.

Twenty-five represents one less than 26 cents, the rule being that the number at the left, which is the multiplicand, shall be one less in every case due to the fact that 1 is carried over from the nines to the immediate left each time the Crank is turned forward.

Now divide 1728 by (88) 12 by forward turns of the Crank, always remembering that the complement 88 represents the 12.

After one forward turn of the Crank the dials will show:

0 0 0 1 0 0 0 0	Upper Dial
0 0 0 0 2 6.0 0 5 2 8.0 0	Lower Dial

0 0 0.2 5 9 8 8	Keyboard
-----------------	----------

That is as we are obtaining the result of the division of 1728 by 12 in the Upper Dial we are multiplying that result by .26 at the left in the Lower Dial.

As 12 (88) will not be contained in 5, shift Carriage to the left.

First forward turn in this position gives:

0 0 0 1 1 0.0 0	Upper Dial
0 0 0 2 8.6 0 4 0 8.0 0	Lower Dial

0 0 0.2 5 9 8 8	Keyboard
-----------------	----------

After four forward turns in this position Dials read:

0 0 0 1 4 0.0 0	Upper Dial
0 0 0 3 6.4 0 0 4 8.0 0	Lower Dial

0 0 0.2 5 9 8 8	Keyboard
-----------------	----------

Further turns cannot be made in this position without bringing up nines over the 88 which would indicate that we had turned too far. Therefore, shift Carriage to the left again and divide by forward turns, as before.

After four forward turns Dials read:

0 0 0 1 4 +.0 0	Upper Dial
0 0 3 7.4 4 0 0 0.0 0	Lower Dial

0 0 0.2 5 9 8 8	Keyboard
-----------------	----------

Giving the same result as in the previous example, that is 144 dozen and \$37.44 total cost. By this method the 1728 is being cleared out as the other numbers are being built up and therefore the numbers can never run together. Whenever we turn too many turns in any

position the nines will come up and we must then reverse the Crank to correct.

#### Figuring Interest by Simultaneous Multiplication and Division.

Note: For another method of figuring interest see page 28.

Example: Find the interest on \$8865.25 at 5% for 456 days, figuring 365 days to the year.

First point off 2 decimal places Upper Dial.

2 decimal places Keyboard.

4 decimal places Lower Dial.

Set up 8865.25 on the Keyboard and multiply by .05, giving the interest for 1 year in the Lower Dial, 443.2625.

This interest must now be divided by 365 to obtain the interest for one day and that result multiplied by 456 to obtain the total interest for 456 days. Proceed as follows:

Change the Upper Dial decimal point to 4 and Keyboard decimal point to 4 and add another decimal point in the Lower Dial between the 8th and 9th positions as shown herewith. The reason for changing the decimal points is that we are going to divide by (635) 365 a whole number located at the right of the Keyboard with "no" decimal point: since we have 4 decimal places in the Lower Dial and none on the Keyboard with respect to this division, we must have 4 in the Upper Dial for the quotient which we will obtain.

Leaving the interest for one year in the Lower Dial, set up on Keyboard (455)9(635), the complement, 635, representing the divisor 365, the 455 representing one less than the multiplier, 456, with the connecting nine between. Clear the Upper Dial and shift the Carriage so as to bring the (635) 365 under the 443, into which the division is to be made.

0 0 0 0.0 0 0 0	Upper Dial
0 0 0 0.0 4 4 3.2 6 2 5	Lower Dial
0 4 5 5.9 6 3 5	Keyboard

Since this quotient will be multiplied by the (455) 456 with 4 decimal places to the right on the Keyboard, we must set off the other decimal point in the Lower Dial at the sum of 4 and 4 or 8 places, to accommodate the result of this multiplication.

Now proceed by forward turns of the Crank to divide (635) 365 into 443.2625 as in previous examples, showing final result as follows:

0 0 0 1 .2 1 4 4	Upper Dial—(interest for one day)
5 5 3 .7 6 6 4 .0 0 6 5	Lower Dial—(interest for 456 days)
0 4 5 5 .9 6 3 5	Keyboard

The \$553.766 at the left in the Lower Dial is the total interest, that is, the product of 1.2144, the interest for one day, and the 456 days.

#### Figuring Tonnage by Simultaneous Multiplication and Division.

This same method of simultaneous multiplication and division may be applied to various kinds of calculations as for example:

Find the number of tons and the total cost of 5197 pounds at \$25.25 per long ton. In this example the capacity of the Keyboard is not sufficient to set up the complement of 2240 (7760) the connecting nine and the 25.24. Therefore set up 776 at the right dropping the cipher, then the connecting nine and 25.24 as shown herewith:

0 0 0 .0 0 0 0 0 0	Upper Dial
0 0 0 .0 0 0 5 1 9 7 .0 0 0 0	Lower Dial
2 5 .2 4 9 7 7 6	Keyboard

The change in the decimal points from four to five in the Upper Dial is necessary to make allowance for dropping the cipher. That is when we drop the cipher we have "minus one" decimal place at the right on the Keyboard we must therefore fix the Upper Dial decimal point at five places in order to make the sum of the "minus one" on the Keyboard and the five in the Upper Dial equivalent to the four already fixed on the Lower Dial.

Proceed as in the previous example showing the final result 2.32 tons in the Upper Dial and total cost \$58.58 in the Lower Dial thus:

0 0 2 .3 2 0 0 0	Upper Dial—(No. of tons)
0 5 8 .5 8 0 0 0 0 2 0 0 0	Lower Dial—(total cost)
2 5 .2 4 9 7 7 6	Keyboard

Now proceed by forward turns of the Crank to divide (635) 365 into 443.2625 as in previous examples, showing final result as follows:

0 0 0 1 .2 1 4 4	Upper Dial—(interest for one day)
5 5 3 .7 6 6 4 .0 0 6 5	Lower Dial—(interest for 456 days)
0 4 5 5 .9 6 3 5	Keyboard

The \$553.766 at the left in the Lower Dial is the total interest, that is, the product of 1.2144, the interest for one day, and the 456 days.

#### Figuring Tonnage by Simultaneous Multiplication and Division.

This same method of simultaneous multiplication and division may be applied to various kinds of calculations as for example:

Find the number of tons and the total cost of 5197 pounds at \$25.25 per long ton. In this example the capacity of the Keyboard is not sufficient to set up the complement of 2240 (7760) the connecting nine and the 25.24. Therefore set up 776 at the right dropping the cipher, then the connecting nine and 25.24 as shown herewith:

0 0 0 .0 0 0 0 0	Upper Dial
0 0 0 .0 0 0 5 1 9 7 .0 0 0 0	Lower Dial
2 5 .2 4 9 7 7 6	Keyboard

The change in the decimal points from four to five in the Upper Dial is necessary to make allowance for dropping the cipher. That is when we drop the cipher we have "minus one" decimal place at the right on the Keyboard we must therefore fix the Upper Dial decimal point at five places in order to make the sum of the "minus one" on the Keyboard and the five in the Upper Dial equivalent to the four already fixed on the Lower Dial.

Proceed as in the previous example showing the final result 2.32 tons in the Upper Dial and total cost \$58.58 in the Lower Dial thus:

0 0 2 .3 2 0 0 0	Upper Dial—(No. of tons)
0 5 8 .5 8 0 0 0 0 2 0 0 0	Lower Dial—(total cost)
2 5 .2 4 9 7 7 6	Keyboard

## **Systems Service Department**

The Monroe Systems Service Department is maintained for the purpose of giving expert service on the best methods of handling your own particular accounting problems.

Special tables of decimal equivalents will be supplied promptly upon request, also methods for finding square or cube roots, making up payroll tables, foreign exchange tables, grain tables, interest, chain discount equivalents, lumber tables, tax apportionment, etc.

Short cuts will be devised whenever possible and immediate attention will be given to all inquiries.

If you will state your line of business, and the class of work you are interested in, special problems will be sent you showing approved methods in use by concerns in your own line.

## **Definitions**

**MINUEND**—The number from which another is to be subtracted.

**SUBTRAHEND**—The number which is to be subtracted.

**MULTIPLICAND**—The number to be multiplied by another.

**MULTIPLIER**—The number by which another is to be multiplied.

**DIVIDEND**—The number to be divided.

**DIVISOR**—The number by which the dividend is divided.

**QUOTIENT**—The result obtained by dividing.

**COMPLEMENT**—The complement of a number is the difference between that number and the next higher power of ten, thus the complement of 6 is 4, of 12 is 88, of 73 is 27, of 28 is 72, of 2142 is 7858, etc.

**RECIPROCAL**—The reciprocal of a number is 1 divided by that number.

**Table of Interest on \$1000.00 for 1 Day at Percentages  
from 1/16% to 12%—365 Day Basis.**

To figure interest, place decimal markers at 3 Places in Upper Dial, 6 Places in Keyboard, 9 Places in Lower Dial.

Multiply decimal corresponding to rate by the number of days, copy the result to Keyboard and multiply by principal in dollars.

Per Cent.	Interest	Per Cent.	Interest	Per Cent.	Interest	Per Cent.	Interest	Per Cent.	Interest
$\frac{1}{16}$ .0017 12 33	<b>2</b> .0547 94 52	<b>4</b> .1095 89 04	<b>6</b> .1643 83 56	<b>8</b> .2191 78 08					
$\frac{1}{8}$ .0034 24 66	$2\frac{1}{16}$ .0565 06 85	$4\frac{1}{16}$ .1113 01 37	$6\frac{1}{16}$ .1660 95 89						
$\frac{3}{16}$ .0051 36 99	$2\frac{1}{8}$ .0582 19 18	$4\frac{1}{8}$ .1130 13 70	$6\frac{1}{8}$ .1678 08 22	$8\frac{1}{4}$ .2260 27 40					
	$2\frac{3}{16}$ .0599 31 51	$4\frac{3}{16}$ .1147 26 03	$6\frac{3}{16}$ .1695 20 55						
$\frac{1}{4}$ .0068 49 32	$2\frac{1}{4}$ .0616 43 84	$4\frac{1}{4}$ .1164 38 36	$6\frac{1}{4}$ .1712 32 88						
$\frac{5}{16}$ .0085 61 64	$2\frac{5}{16}$ .0633 56 16	$4\frac{5}{16}$ .1181 50 68	$6\frac{5}{16}$ .1729 45 21						
$\frac{7}{16}$ .0102 73 97	$2\frac{7}{8}$ .0650 68 49	$4\frac{7}{8}$ .1198 63 01	$6\frac{7}{8}$ .1746 57 53						
$\frac{11}{16}$ .0119 86 30	$2\frac{7}{16}$ .0667 80 82	$4\frac{7}{16}$ .1215 75 34	$6\frac{7}{16}$ .1763 69 86	$8\frac{3}{4}$ .2397 26 03					
$\frac{1}{2}$ .0136 98 63	$2\frac{1}{2}$ .0684 93 15	$4\frac{1}{2}$ .1232 87 67	$6\frac{1}{2}$ .1780 82 19						
$\frac{9}{16}$ .0154 10 96	$2\frac{9}{16}$ .0702 05 48	$4\frac{9}{16}$ .1250 00 00	$6\frac{9}{16}$ .1797 94 52	<b>9</b> .2465 75 34					
$\frac{5}{8}$ .0171 23 29	$2\frac{5}{8}$ .0719 17 81	$4\frac{5}{8}$ .1267 12 33	$6\frac{5}{8}$ .1815 06 85						
$\frac{11}{16}$ .0188 35 62	$2\frac{11}{16}$ .0736 30 14	$4\frac{11}{16}$ .1284 24 66	$6\frac{11}{16}$ .1832 19 18	$9\frac{1}{4}$ .2534 24 66					
$\frac{3}{4}$ .0205 47 95	$2\frac{3}{4}$ .0753 42 47	$4\frac{3}{4}$ .1301 36 99	$6\frac{3}{4}$ .1849 31 51						
$\frac{13}{16}$ .0222 60 27	$2\frac{13}{16}$ .0770 54 79	$4\frac{13}{16}$ .1318 49 32	$6\frac{13}{16}$ .1866 43 84	$9\frac{1}{2}$ .2602 73 97					
$\frac{7}{8}$ .0239 72 60	$2\frac{7}{8}$ .0787 67 12	$4\frac{7}{8}$ .1335 61 64	$6\frac{7}{8}$ .1883 56 16						
$\frac{15}{16}$ .0256 84 93	$2\frac{15}{16}$ .0804 79 45	$4\frac{15}{16}$ .1352 73 97	$6\frac{15}{16}$ .1900 68 49	$9\frac{3}{4}$ .2671 23 29					
<b>1</b> .0273 97 26	<b>3</b> .0821 91 78	<b>5</b> .1369 86 30	<b>7</b> .1917 80 82	<b>10</b> .2739 72 60					
$1\frac{1}{16}$ .0291 09 59	$3\frac{1}{16}$ .0839 04 11	$5\frac{1}{16}$ .1386 98 63	$7\frac{1}{16}$ .1934 93 15						
$1\frac{1}{8}$ .0308 21 92	$3\frac{1}{8}$ .0856 16 44	$5\frac{1}{8}$ .1404 10 96	$7\frac{1}{8}$ .1952 05 48						
$1\frac{3}{16}$ .0325 34 25	$3\frac{3}{16}$ .0873 28 77	$5\frac{3}{16}$ .1421 23 29	$7\frac{3}{16}$ .1969 17 81	$10\frac{1}{4}$ .2808 21 92					
$1\frac{1}{4}$ .0342 46 58	$3\frac{1}{4}$ .0890 41 10	$5\frac{1}{4}$ .1438 35 62	$7\frac{1}{4}$ .1986 30 14						
$1\frac{5}{16}$ .0359 58 90	$3\frac{5}{16}$ .0907 53 42	$5\frac{5}{16}$ .1455 47 95	$7\frac{5}{16}$ .2003 42 47	$10\frac{1}{2}$ .2876 71 23					
$1\frac{1}{8}$ .0376 71 23	$3\frac{3}{8}$ .0924 65 75	$5\frac{3}{8}$ .1472 60 27	$7\frac{3}{8}$ .2020 54 79						
$1\frac{7}{16}$ .0393 83 56	$3\frac{7}{16}$ .0941 78 08	$5\frac{7}{16}$ .1489 72 60	$7\frac{7}{16}$ .2037 67 12	$10\frac{3}{4}$ .2945 20 55					
$1\frac{1}{2}$ .0410 95 89	$3\frac{1}{2}$ .0958 90 41	$5\frac{1}{2}$ .1506 84 93	$7\frac{1}{2}$ .2054 79 45						
$1\frac{9}{16}$ .0428 08 22	$3\frac{9}{16}$ .0976 02 74	$5\frac{9}{16}$ .1523 97 26	$7\frac{9}{16}$ .2071 91 78	<b>11</b> .3013 69 86					
$1\frac{5}{8}$ .0445 20 55	$3\frac{5}{8}$ .0993 15 07	$5\frac{5}{8}$ .1541 09 59	$7\frac{5}{8}$ .2089 04 11						
$1\frac{11}{16}$ .0462 32 88	$3\frac{11}{16}$ .1010 27 40	$5\frac{11}{16}$ .1558 21 92	$7\frac{11}{16}$ .2106 16 44	$11\frac{1}{4}$ .3082 19 18					
$1\frac{3}{4}$ .0479 45 21	$3\frac{3}{4}$ .1027 39 73	$5\frac{3}{4}$ .1575 34 25	$7\frac{3}{4}$ .2123 28 77						
$1\frac{13}{16}$ .0496 57 53	$3\frac{13}{16}$ .1044 52 05	$5\frac{13}{16}$ .1592 46 58	$7\frac{13}{16}$ .2140 41 10	$11\frac{1}{2}$ .3150 68 49					
$1\frac{7}{8}$ .0513 69 86	$3\frac{7}{8}$ .1061 64 38	$5\frac{7}{8}$ .1609 58 90	$7\frac{7}{8}$ .2157 53 42						
$1\frac{15}{16}$ .0530 82 19	$3\frac{15}{16}$ .1078 76 71	$5\frac{15}{16}$ .1626 71 23	$7\frac{15}{16}$ .2174 65 75	<b>12</b> .3287 67 12					

NOTE:- For interest on \$1,000,000 or less, use first six places; use all places for larger amounts.

## Table of Interest on \$1000.00 for 1 Day at Percentages from 1/16% to 12%—360 Day Basis.

To figure interest, place decimal markers at 3 Places in Upper Dial, 6 Places in Keyboard, 9 Places in Lower Dial.

Multiply decimal corresponding to rate by the number of days, copy the result to Keyboard and multiply by principal in dollars.

Per Cent.	Interest	Per Cent.	Interest	Per Cent.	Interest	Per Cent.	Interest	Per Cent.	Interest
$\frac{1}{16}$ .0017 36 11	<b>2</b>	.0555 55 56	<b>4</b>	.1111 11 11	<b>6</b>	.1666 66 67	<b>8</b>	.2222 22 22	
$\frac{1}{8}$ .0034 72 22	$2\frac{1}{16}$	.0572 91 67	$4\frac{1}{16}$	.1128 47 22	$6\frac{1}{16}$	.1684 02 78			
$\frac{3}{16}$ .0052 08 33	$2\frac{7}{16}$	.0590 27 78	$4\frac{7}{16}$	.1145 83 33	$6\frac{7}{16}$	.1701 38 89	$8\frac{1}{4}$	.2291 66 67	
		.0607 63 89	$4\frac{3}{16}$	.1163 19 44	$6\frac{3}{16}$	.1718 75 00			
$\frac{1}{4}$ .0069 44 44	$2\frac{1}{4}$	.0625 00 00	$4\frac{1}{4}$	.1180 55 56	$6\frac{1}{4}$	.1736 11 11	$8\frac{1}{2}$	.2361 11 11	
$\frac{5}{16}$ .0086 80 56	$2\frac{5}{16}$	.0642 36 11	$4\frac{5}{16}$	.1197 91 67	$6\frac{5}{16}$	.1753 47 22			
$\frac{3}{8}$ .0104 16 67	$2\frac{3}{8}$	.0659 72 22	$4\frac{3}{8}$	.1215 27 78	$6\frac{3}{8}$	.1770 83 33	$8\frac{3}{4}$	.2430 55 56	
$\frac{7}{16}$ .0121 52 78	$2\frac{7}{16}$	.0677 08 33	$4\frac{7}{16}$	.1232 63 89	$6\frac{7}{16}$	.1788 19 44			
$\frac{1}{2}$ .0138 88 89	$2\frac{1}{2}$	.0694 44 44	$4\frac{1}{2}$	.1250 00 00	$6\frac{1}{2}$	.1805 55 56	<b>9</b>	.2500 00 00	
$\frac{9}{16}$ .0156 25 00	$2\frac{9}{16}$	.0711 80 56	$4\frac{9}{16}$	.1267 36 11	$6\frac{9}{16}$	.1822 91 67			
$\frac{5}{8}$ .0173 61 11	$2\frac{5}{8}$	.0729 16 67	$4\frac{5}{8}$	.1284 72 22	$6\frac{5}{8}$	.1840 27 78	$9\frac{1}{4}$	.2569 44 44	
$\frac{11}{16}$ .0190 97 22	$2\frac{11}{16}$	.0746 52 78	$4\frac{11}{16}$	.1302 08 33	$6\frac{11}{16}$	.1857 63 89			
$\frac{3}{4}$ .0208 33 33	$2\frac{3}{4}$	.0763 88 89	$4\frac{3}{4}$	.1319 44 44	$6\frac{3}{4}$	.1875 00 00	$9\frac{1}{2}$	.2638 88 89	
$\frac{13}{16}$ .0225 69 44	$2\frac{13}{16}$	.0781 25 00	$4\frac{13}{16}$	.1336 80 56	$6\frac{13}{16}$	.1892 36 11			
$\frac{7}{8}$ .0243 05 56	$2\frac{7}{8}$	.0798 61 11	$4\frac{7}{8}$	.1354 16 67	$6\frac{7}{8}$	.1909 72 22	$9\frac{3}{4}$	.2708 33 33	
$\frac{15}{16}$ .0260 41 67	$2\frac{15}{16}$	.0815 97 22	$4\frac{15}{16}$	.1371 52 78	$6\frac{15}{16}$	.1927 08 33			
<b>1</b> .0277 77 78	<b>3</b>	.0833 33 33	<b>5</b>	.1388 88 89	<b>7</b>	.1944 44 44	<b>10</b>	.2777 77 78	
$1\frac{1}{16}$ .0295 13 89	$3\frac{1}{16}$	.0850 69 44	$5\frac{1}{16}$	.1406 25 00	$7\frac{1}{16}$	.1961 80 56			
$1\frac{1}{8}$ .0312 50 00	$3\frac{1}{8}$	.0868 05 56	$5\frac{1}{8}$	.1423 61 11	$7\frac{1}{8}$	.1979 16 67	$10\frac{1}{4}$	.2847 22 22	
$1\frac{3}{16}$ .0329 86 11	$3\frac{3}{16}$	.0885 41 67	$5\frac{3}{16}$	.1440 97 22	$7\frac{3}{16}$	.1996 52 78			
$1\frac{1}{4}$ .0347 22 22	$3\frac{1}{4}$	.0902 77 78	$5\frac{1}{4}$	.1458 33 33	$7\frac{1}{4}$	.2013 88 89	$10\frac{1}{2}$	.2916 66 67	
$1\frac{5}{16}$ .0364 58 33	$3\frac{5}{16}$	.0920 13 89	$5\frac{5}{16}$	.1475 69 44	$7\frac{5}{16}$	.2031 25 00			
$1\frac{3}{8}$ .0381 94 44	$3\frac{3}{8}$	.0937 50 00	$5\frac{3}{8}$	.1493 05 56	$7\frac{3}{8}$	.2048 61 11	$10\frac{3}{4}$	.2986 11 11	
$1\frac{7}{16}$ .0399 30 56	$3\frac{7}{16}$	.0954 86 11	$5\frac{7}{16}$	.1510 41 67	$7\frac{7}{16}$	.2065 97 22			
$1\frac{1}{2}$ .0416 66 67	$3\frac{1}{2}$	.0972 22 22	$5\frac{1}{2}$	.1527 77 78	$7\frac{1}{2}$	.2083 33 33	<b>11</b>	.3055 55 56	
$1\frac{9}{16}$ .0434 02 78	$3\frac{9}{16}$	.0989 58 33	$5\frac{9}{16}$	.1545 13 89	$7\frac{9}{16}$	.2100 69 44			
$1\frac{5}{8}$ .0451 38 89	$3\frac{5}{8}$	.1006 94 44	$5\frac{5}{8}$	.1562 50 00	$7\frac{5}{8}$	.2118 05 56			
$1\frac{11}{16}$ .0468 75 00	$3\frac{11}{16}$	.1024 30 56	$5\frac{11}{16}$	.1579 86 11	$7\frac{11}{16}$	.2135 41 67	$11\frac{1}{4}$	.3125 00 00	
$1\frac{3}{4}$ .0486 11 11	$3\frac{3}{4}$	.1041 66 67	$5\frac{3}{4}$	.1597 22 22	$7\frac{3}{4}$	.2152 77 78	$11\frac{1}{2}$	.3194 44 44	
$1\frac{13}{16}$ .0503 47 22	$3\frac{13}{16}$	.1059 02 78	$5\frac{13}{16}$	.1614 58 33	$7\frac{13}{16}$	.2170 13 89	$11\frac{3}{4}$	.3263 88 89	
$1\frac{7}{8}$ .0520 83 33	$3\frac{7}{8}$	.1076 38 89	$5\frac{7}{8}$	.1631 94 44	$7\frac{7}{8}$	.2187 50 00			
$1\frac{11}{16}$ .0538 19 44	$3\frac{15}{16}$	.1093 75 00	$5\frac{15}{16}$	.1649 30 56	$7\frac{15}{16}$	.2204 86 11	<b>12</b>	.3333 33 33	

NOTE:- For interest on \$1,000,000 or less, use first six places; use all places for larger amounts.

I. Decimal equivalents of common fractions to be used wherever prices or quantities are quoted in fractions.

8ths	16ths	32nds Avoir. Oz.	Equivalent Pound	24ths	12ths	6ths
				Troy Oz.		
		1	.03125			
			.04167	1 $\frac{1}{2}$		
1	1	2	.06250			
			.08333	2 $\frac{1}{3}$	1	
		3	.09375			
1	2	4	.12500	3 $1\frac{1}{2}$		
		5	.15625			
			.16667	4 $\frac{2}{3}$	2 1	
3	3	6	.18750			
			.20833	5 $2\frac{1}{2}$		
		7	.21875			
2	4	8	.25000	6 $\frac{3}{4}$	3	
		9	.28125			
			.29167	7 $3\frac{1}{2}$		
5	5	10	.31250			
			.33333	8 $\frac{4}{5}$	4 2	
		11	.34375			
3	6	12	.37500	9 $4\frac{1}{2}$		
		13	.40625			
			.41667	10 $\frac{5}{8}$	5	
7	7	14	.43750			
			.45833	11 $5\frac{1}{2}$		
		15	.46875			
4	8	16	.50000	12 $\frac{6}{7}$	6 3	

8ths	16ths	32nds Avoir. Oz.	Equivalent Pound	24ths	12ths	6ths
				Troy Oz.		
		17	.53125			
			.54167	13 $6\frac{1}{2}$		
9	9	18	.56250			
			.58333	14 $\frac{7}{8}$	7	
		19	.59375			
5	10	20	.62500	15 $7\frac{1}{2}$		
		21	.65625			
			.66667	16 $\frac{8}{9}$	8 4	
11	11	22	.68750			
			.70833	17 $8\frac{1}{2}$		
		23	.71875			
6	12	24	.75000	18 $\frac{9}{10}$	9	
		25	.78125			
			.79167	19 $9\frac{1}{2}$		
13	13	26	.81250			
			.83333	20 $\frac{10}{11}$	10 5	
		27	.84375			
7	14	28	.87500	21 $10\frac{1}{2}$		
		29	.90625			
			.91667	22 $11\frac{1}{2}$	11	
15	15	30	.93750			
			.95833	23 $11\frac{1}{2}$		
		31	.96875			
8	16	32	1.00000	24 $\frac{12}{13}$	12 6	

## II. Table of Interest Rate for 360 days.

RULE: Multiply principal by 1/100th of the number of days and divide by amount in the table corresponding to the given rate.

Rate %	Divisor	Rate %	Divisor	Rate %	Divisor	Rate %	Divisor
<b>1</b>	<b>360.</b>	<b><math>3 \frac{1}{2}</math></b>	<b>102.857</b>	<b>6</b>	<b>60.</b>	<b><math>8 \frac{1}{2}</math></b>	<b>42.352</b>
<b><math>1 \frac{1}{4}</math></b>	<b>288.</b>	<b><math>3 \frac{3}{4}</math></b>	<b>96.</b>	<b><math>6 \frac{1}{4}</math></b>	<b>57.60</b>	<b><math>8 \frac{3}{4}</math></b>	<b>41.142</b>
<b><math>1 \frac{1}{2}</math></b>	<b>240.</b>	<b>4</b>	<b>90.</b>	<b><math>6 \frac{1}{2}</math></b>	<b>55.384</b>	<b>9</b>	<b>40.</b>
<b><math>1 \frac{3}{4}</math></b>	<b>205.714</b>	<b><math>4 \frac{1}{4}</math></b>	<b>84.705</b>	<b><math>6 \frac{3}{4}</math></b>	<b>53.333</b>	<b><math>9 \frac{1}{4}</math></b>	<b>38.918</b>
<b>2</b>	<b>180.</b>	<b><math>4 \frac{1}{2}</math></b>	<b>80.</b>	<b>7</b>	<b>51.428</b>	<b><math>9 \frac{1}{2}</math></b>	<b>37.894</b>
<b><math>2 \frac{1}{4}</math></b>	<b>160.</b>	<b><math>4 \frac{3}{4}</math></b>	<b>75.789</b>	<b><math>7 \frac{1}{4}</math></b>	<b>49.655</b>	<b><math>9 \frac{3}{4}</math></b>	<b>36.923</b>
<b><math>2 \frac{1}{2}</math></b>	<b>144.</b>	<b>5</b>	<b>72.</b>	<b><math>7 \frac{1}{2}</math></b>	<b>48.</b>	<b>10</b>	<b>36.</b>
<b><math>2 \frac{3}{4}</math></b>	<b>130.909</b>	<b><math>5 \frac{1}{4}</math></b>	<b>68.571</b>	<b><math>7 \frac{3}{4}</math></b>	<b>46.451</b>	<b><math>10 \frac{1}{4}</math></b>	<b>35.121</b>
<b>3</b>	<b>120.</b>	<b><math>5 \frac{1}{2}</math></b>	<b>65.454</b>	<b>8</b>	<b>45.</b>	<b><math>10 \frac{1}{2}</math></b>	<b>34.285</b>
<b><math>3 \frac{1}{4}</math></b>	<b>110.769</b>	<b><math>5 \frac{3}{4}</math></b>	<b>62.608</b>	<b><math>8 \frac{1}{4}</math></b>	<b>43.636</b>	<b><math>10 \frac{3}{4}</math></b>	<b>33.488</b>

This table may be extended for any rate by dividing rate into 360.

## Table of Interest Rate for 365 days.

RULE: Multiply principal by 1/100th of the number of days and divide by amount in the table corresponding to the given rate.

Rate %	Divisor	Rate %	Divisor	Rate %	Divisor	Rate %	Divisor
<b>1</b>	<b>365.</b>	<b><math>3 \frac{1}{2}</math></b>	<b>104.285</b>	<b>6</b>	<b>60.833</b>	<b><math>8 \frac{1}{2}</math></b>	<b>42.941</b>
<b><math>1 \frac{1}{4}</math></b>	<b>292.</b>	<b><math>3 \frac{3}{4}</math></b>	<b>97.333</b>	<b><math>6 \frac{1}{4}</math></b>	<b>58.4</b>	<b><math>8 \frac{3}{4}</math></b>	<b>41.714</b>
<b><math>1 \frac{1}{2}</math></b>	<b>243.333</b>	<b>4</b>	<b>91.25</b>	<b><math>6 \frac{1}{2}</math></b>	<b>56.153</b>	<b>9</b>	<b>40.555</b>
<b><math>1 \frac{3}{4}</math></b>	<b>208.571</b>	<b><math>4 \frac{1}{4}</math></b>	<b>85.882</b>	<b><math>6 \frac{3}{4}</math></b>	<b>54.074</b>	<b><math>9 \frac{1}{4}</math></b>	<b>39.459</b>
<b>2</b>	<b>182.5</b>	<b><math>4 \frac{1}{2}</math></b>	<b>81.111</b>	<b>7</b>	<b>52.142</b>	<b><math>9 \frac{1}{2}</math></b>	<b>38.421</b>
<b><math>2 \frac{1}{4}</math></b>	<b>162.222</b>	<b><math>4 \frac{3}{4}</math></b>	<b>76.842</b>	<b><math>7 \frac{1}{4}</math></b>	<b>50.344</b>	<b><math>9 \frac{3}{4}</math></b>	<b>37.435</b>
<b><math>2 \frac{1}{2}</math></b>	<b>146.</b>	<b>5</b>	<b>73.</b>	<b><math>7 \frac{1}{2}</math></b>	<b>48.666</b>	<b>10</b>	<b>36.5</b>
<b><math>2 \frac{3}{4}</math></b>	<b>132.727</b>	<b><math>5 \frac{1}{4}</math></b>	<b>69.523</b>	<b><math>7 \frac{3}{4}</math></b>	<b>47.097</b>	<b><math>10 \frac{1}{4}</math></b>	<b>35.609</b>
<b>3</b>	<b>121.666</b>	<b><math>5 \frac{1}{2}</math></b>	<b>66.363</b>	<b>8</b>	<b>45.625</b>	<b><math>10 \frac{1}{2}</math></b>	<b>34.761</b>
<b><math>3 \frac{1}{4}</math></b>	<b>112.307</b>	<b><math>5 \frac{3}{4}</math></b>	<b>63.478</b>	<b><math>8 \frac{1}{4}</math></b>	<b>44.242</b>	<b><math>10 \frac{3}{4}</math></b>	<b>33.953</b>

This table may be extended for any rate by dividing rate into 365.

### III. Decimal equivalents of a pound Sterling for shillings and pence to be used in figuring English Exchange.

For converting Sterling to dollars, set pounds and decimal pounds in Keyboard and multiply by rate.

For converting dollars to pounds Sterling, set dollars in extreme left of Lower Dial. Set up rate on extreme left of Keyboard, and divide into amount in Lower Dial reading pounds and decimal pounds in Upper Dial. Convert decimal pounds to shilling and pence equivalents by referring to amount in table.

s d	s d	s d	s d	s d
.00417 0- 1	.20417 4- 1	.40417 8- 1	.60417 12- 1	.80417 16- 1
.00833 0- 2	.20833 4- 2	.40833 8- 2	.60833 12- 2	.80833 16- 2
.01250 0- 3	.21250 4- 3	.41250 8- 3	.61250 12- 3	.81250 16- 3
.01667 0- 4	.21667 4- 4	.41667 8- 4	.61667 12- 4	.81667 16- 4
.02083 0- 5	.22083 4- 5	.42083 8- 5	.62083 12- 5	.82083 16- 5
.02500 0- 6	.22500 4- 6	.42500 8- 6	.62500 12- 6	.82500 16- 6
.02917 0- 7	.22917 4- 7	.42917 8- 7	.62917 12- 7	.82917 16- 7
.03333 0- 8	.23333 4- 8	.43333 8- 8	.63333 12- 8	.83333 16- 8
.03750 0- 9	.23750 4- 9	.43750 8- 9	.63750 12- 9	.83750 16- 9
.04167 0-10	.24167 4-10	.44167 8-10	.64167 12-10	.84167 16-10
.04583 0-11	.24583 4-11	.44583 8-11	.64583 12-11	.84583 16-11
.05000 1- 0	.25000 5- 0	.45000 9- 0	.65000 13- 0	.85000 17- 0
.05417 1- 1	.25417 5- 1	.45417 9- 1	.65417 13- 1	.85417 17- 1
.05833 1- 2	.25833 5- 2	.45833 9- 2	.65833 13- 2	.85833 17- 2
.06250 1- 3	.26250 5- 3	.46250 9- 3	.66250 13- 3	.86250 17- 3
.06667 1- 4	.26667 5- 4	.46667 9- 4	.66667 13- 4	.86667 17- 4
.07083 1- 5	.27083 5- 5	.47083 9- 5	.67083 13- 5	.87083 17- 5
.07500 1- 6	.27500 5- 6	.47500 9- 6	.67500 13- 6	.87500 17- 6
.07917 1- 7	.27917 5- 7	.47917 9- 7	.67917 13- 7	.87917 17- 7
.08333 1- 8	.28333 5- 8	.48333 9- 8	.68333 13- 8	.88333 17- 8
.08750 1- 9	.28750 5- 9	.48750 9- 9	.68750 13- 9	.88750 17- 9
.09167 1-10	.29167 5-10	.49167 9-10	.69167 13-10	.89167 17-10
.09583 1-11	.29583 5-11	.49583 9-11	.69583 13-11	.89583 17-11
.10000 2- 0	.30000 6- 0	.50000 10- 0	.70000 14- 0	.90000 18- 0
.10417 2- 1	.30417 6- 1	.50417 10- 1	.70417 14- 1	.90417 18- 1
.10833 2- 2	.30833 6- 2	.50833 10- 2	.70833 14- 2	.90833 18- 2
.11250 2- 3	.31250 6- 3	.51250 10- 3	.71250 14- 3	.91250 18- 3
.11667 2- 4	.31667 6- 4	.51667 10- 4	.71667 14- 4	.91667 18- 4
.12083 2- 5	.32083 6- 5	.52083 10- 5	.72083 14- 5	.92083 18- 5
.12500 2- 6	.32500 6- 6	.52500 10- 6	.72500 14- 6	.92500 18- 6
.12917 2- 7	.32917 6- 7	.52917 10- 7	.72917 14- 7	.92917 18- 7
.13333 2- 8	.33333 6- 8	.53333 10- 8	.73333 14- 8	.93333 18- 8
.13750 2- 9	.33750 6- 9	.53750 10- 9	.73750 14- 9	.93750 18- 9
.14167 2-10	.34167 6-10	.54167 10-10	.74167 14-10	.94167 18-10
.14583 2-11	.34583 6-11	.54583 10-11	.74583 14-11	.94583 18-11
.15000 3- 0	.35000 7- 0	.55000 11- 0	.75000 15- 0	.95000 19- 0
.15417 3- 1	.35417 7- 1	.55417 11- 1	.75417 15- 1	.95417 19- 1
.15833 3- 2	.35833 7- 2	.55833 11- 2	.75833 15- 2	.95833 19- 2
.16250 3- 3	.36250 7- 3	.56250 11- 3	.76250 15- 3	.96250 19- 3
.16667 3- 4	.36667 7- 4	.56667 11- 4	.76667 15- 4	.96667 19- 4
.17083 3- 5	.37083 7- 5	.57083 11- 5	.77083 15- 5	.97083 19- 5
.17500 3- 6	.37500 7- 6	.57500 11- 6	.77500 15- 6	.97500 19- 6
.17917 3- 7	.37917 7- 7	.57917 11- 7	.77917 15- 7	.97917 19- 7
.18333 3- 8	.38333 7- 8	.58333 11- 8	.78333 15- 8	.98333 19- 8
.18750 3- 9	.38750 7- 9	.58750 11- 9	.78750 15- 9	.98750 19- 9
.19167 3-10	.39167 7-10	.59167 11-10	.79167 15-10	.99167 19-10
.19583 3-11	.39583 7-11	.59583 11-11	.79583 15-11	.99583 19-11
.20000 4- 0	.40000 8- 0	.60000 12- 0	.80000 16- 0	1.00000 20- 0

IV. Decimal equivalents of "64ths," commonly used in connection with Foreign Exchange rates.

8ths	16ths	32nds	64ths	8ths	16ths	32nds	64ths
			1 .015625				33 .515625
		1	.031250		17		.531250
			3 .046875				35 .546875
		1	.062500		9		.562500
			5 .078125				37 .578125
		3	.093750		19		.593750
			7 .109375				39 .609375
1			.125000	5			.625000
			9 .140625				41 .640625
		5	.156250		21		.656250
			11 .171875		11		.671875
		3	.187500				.687500
			13 .203125				45 .703125
		7	.218750		23		.718750
			15 .234375				47 .734375
2			.250000	6			.750000
			17 .265625				49 .765625
		9	.281250		25		.781250
			19 .296875		13		.796875
		5	.312500				.812500
			21 .328125				53 .828125
		11	.343750		27		.843750
			23 .359375				55 .859375
3			.375000	7			.875000
			25 .390625				57 .890625
		13	.406250		29		.906250
			27 .421875				59 .921875
		7	.437500		15		.937500
			29 .453125				61 .953125
		15	.468750		31		.968750
			31 .484375				63 .984375
4	8	16	32 .500000	8	16	32	64 1.000000

V. Table for figuring lumber, stone work, steel beams, angles, etc.  
For finding cubical contents in estimating and billing.

Decimals of a foot for each  $\frac{1}{8}$  of an inch to be used in connection with "squaring" and "cubing" calculations.

		$1/8''$	$1/4''$	$3/8''$	$1/2''$	$5/8''$	$3/4''$	$7/8''$
		.01042	.02083	.03125	.04167	.05208	.06250	.07292
1"	.08333	.09375	.10417	.11458	.12500	.13542	.14583	.15625
2"	.16667	.17708	.18750	.19792	.20833	.21875	.22917	.23958
3"	.25000	.26042	.27083	.28125	.29167	.30208	.31250	.32292
4"	.33333	.34375	.35417	.36458	.37500	.38542	.39583	.40625
5"	.41667	.42708	.43750	.44792	.45833	.46875	.47917	.48958
6"	.50000	.51042	.52083	.53125	.54167	.55208	.56250	.57292
7"	.58333	.59375	.60417	.61458	.62500	.63542	.64583	.65625
8"	.66667	.67708	.68750	.69792	.70833	.71875	.72917	.73958
9"	.75000	.76042	.77083	.78125	.79167	.80208	.81250	.82292
10"	.83333	.84375	.85417	.86458	.87500	.88542	.89583	.90625
11"	.91667	.92708	.93750	.94792	.95833	.96875	.97917	.98958

VI. Table of decimal equivalents of minutes in an hour for figuring payrolls and cost accounting.

Min.	Hour	Min.	Hour	Min.	Hour	Min.	Hour
1	.017	16	.267	31	.517	46	.767
2	.033	17	.283	32	.533	47	.783
3	.050	18	.300	33	.550	48	.800
4	.067	19	.317	34	.567	49	.817
5	.083	20	.333	35	.583	50	.833
6	.100	21	.350	36	.600	51	.850
7	.117	22	.367	37	.617	52	.867
8	.133	23	.383	38	.633	53	.883
9	.150	24	.400	39	.650	54	.900
10	.167	25	.417	40	.667	55	.917
11	.183	26	.433	41	.683	56	.933
12	.200	27	.450	42	.700	57	.950
13	.217	28	.467	43	.717	58	.967
14	.233	29	.483	44	.733	59	.983
15	.250	30	.500	45	.750	60	1.000

VII. Table of decimal equivalents of the fractional parts of a gross for billing when prices are made by the gross and amounts are given in dozens or number of articles.

12ths	doz.	No.		12ths	doz.	No.		12ths	doz.	No.		12ths	doz.	No.		
				3	36	.25000		6	72	.50000		9	108	.75000		
	1	.00694	1	37	.25694	1	73	.50694	1	109	.75694					
	2	.01389	2	38	.26389	2	74	.51389	2	110	.76389					
	3	.02083	3	39	.27083	3	75	.52083	3	111	.77083					
	4	.02778	4	40	.27778	4	76	.52778	4	112	.77778					
	5	.03472	5	41	.28472	5	77	.53472	5	113	.78472					
	6	.04167	6	42	.29167	6	78	.54167	6	114	.79167					
	7	.04861	7	43	.29861	7	79	.54861	7	115	.79861					
	8	.05555	8	44	.30555	8	80	.55555	8	116	.80555					
	9	.06250	9	45	.31250	9	81	.56250	9	117	.81250					
	10	.06944	10	46	.31944	10	82	.56944	10	118	.81944					
	11	.07639	11	47	.32639	11	83	.57639	11	119	.82639					
	1	12	.08333	4	48	.33333	7	84	.58333	10	120	.83333				
1	13	.09028	1	49	.34028	1	85	.59028	1	121	.84028					
2	14	.09722	2	50	.34722	2	86	.59722	2	122	.84722					
3	15	.10417	3	51	.35417	3	87	.60417	3	123	.85417					
4	16	.11111	4	52	.36111	4	88	.61111	4	124	.86111					
5	17	.11805	5	53	.36805	5	89	.61805	5	125	.86805					
6	18	.12500	6	54	.37500	6	90	.62500	6	126	.87500					
7	19	.13194	7	55	.38194	7	91	.63194	7	127	.88194					
8	20	.13889	8	56	.38889	8	92	.63889	8	128	.88889					
9	21	.14583	9	57	.39583	9	93	.64583	9	129	.89583					
10	22	.15278	10	58	.40278	10	94	.65278	10	130	.90278					
11	23	.15972	11	59	.40972	11	95	.65972	11	131	.90972					
	2	24	.16667	5	60	.41667	8	96	.66667	11	132	.91667				
1	25	.17361	1	61	.42361	1	97	.67361	1	133	.92361					
2	26	.18055	2	62	.43055	2	98	.68055	2	134	.93055					
3	27	.18750	3	63	.43750	3	99	.68750	3	135	.93750					
4	28	.19444	4	64	.44444	4	100	.69444	4	136	.94444					
5	29	.20139	5	65	.45139	5	101	.70139	5	137	.95139					
6	30	.20833	6	66	.45833	6	102	.70833	6	138	.95833					
7	31	.21528	7	67	.46528	7	103	.71528	7	139	.96528					
8	32	.22222	8	68	.47222	8	104	.72222	8	140	.97222					
9	33	.22917	9	69	.47917	9	105	.72917	9	141	.97917					
10	34	.23611	10	70	.48611	10	106	.73611	10	142	.98611					
11	35	.24305	11	71	.49305	11	107	.74305	11	143	.99305					

## VIII. Decimal Equivalents to be used in Figuring Chain Discounts.

Rate %	5	7½	10	12½	15	16⅔	20	22½	25
Net	.95	.925	.90	.875	.85	.83333	.80	.775	.75
2½	.92625	.90188	.8775	.85313	.82875	.8125	.78	.75563	.73125
5	.9025	.87875	.855	.83125	.8075	.79167	.76	.73625	.7125
5 2½	.87994	.85678	.83363	.81047	.78731	.77187	.741	.71784	.69469
5 5	.85738	.83481	.81225	.78969	.76713	.75208	.722	.69944	.67688
5 5 2½	.83594	.81394	.79194	.76995	.74795	.73328	.70395	.68195	.65995
7½	.87875	.85563	.8325	.80938	.78625	.77083	.74	.71688	.69375
7½ 2½	.85678	.83423	.81169	.78914	.76659	.75156	.7215	.69895	.67641
7½ 5	.83481	.81284	.79088	.76891	.74694	.73229	.703	.68103	.65906
10	.855	.8325	.81	.7875	.765	.75	.72	.6975	.675
10 2½	.83363	.81169	.78975	.76781	.74588	.73125	.702	.68006	.65813
10 5	.81225	.79088	.7695	.74813	.72675	.7125	.684	.66263	.64125
10 5 2½	.79194	.7711	.75026	.72942	.70858	.69469	.6669	.64606	.62522
10 7½	.79088	.77006	.74925	.72844	.70763	.69375	.666	.64519	.62438
10 10	.7695	.74925	.729	.70875	.6885	.675	.648	.62775	.6075
10 10 5	.73103	.71179	.69255	.67331	.65408	.64125	.6156	.59636	.57713
10 10 5 2½	.71275	.69399	.67524	.65648	.63772	.62522	.60021	.58145	.5627
10 10 10	.69255	.67433	.6561	.63788	.61965	.6075	.5832	.56498	.54675
10 10 10 10	.62330	.60689	.59049	.57409	.55769	.54675	.52488	.50848	.49208
10 10 10 10 10	.56097	.541620	.53144	.51668	.50192	.49208	.47239	.45763	.44287

Rate %	27½	30	32½	33⅓	35	37½	40	42½	45
Net	.725	.70	.675	.66667	.65	.625	.60	.575	.55
2½	.70688	.6825	.65813	.65	.63375	.60938	.585	.56063	.53625
5	.68875	.665	.64125	.63333	.6175	.59375	.57	.54625	.5225
5 2½	.67153	.64838	.62522	.6175	.60206	.57891	.55575	.53259	.50944
5 5	.65431	.63175	.60919	.60167	.58663	.56406	.5415	.51894	.49638
5 5 2½	.63795	.61596	.59396	.58663	.57196	.54996	.52796	.50596	.48397
7½	.67063	.6475	.62438	.61667	.60125	.57813	.555	.53188	.50875
7½ 2½	.65386	.63131	.60877	.60125	.58622	.56367	.54113	.51858	.49603
7½ 5	.63709	.61513	.59316	.58583	.57119	.54922	.52725	.50528	.48331
10	.6525	.63	.6075	.6	.585	.5625	.54	.5175	.495
10 2½	.63619	.61425	.59231	.585	.57038	.54844	.5265	.50456	.48263
10 5	.61988	.5985	.57713	.57	.55575	.53438	.513	.49163	.47025
10 5 2½	.60438	.58354	.56270	.55575	.54186	.52102	.50018	.47933	.45849
10 7½	.60356	.58275	.56194	.555	.54113	.52031	.4995	.47869	.45788
10 10	.58725	.567	.54675	.54	.5265	.50625	.486	.46575	.4455
10 10 5	.55789	.53865	.51941	.513	.50018	.48094	.4617	.44246	.42323
10 10 5 2½	.54394	.52518	.50643	.50018	.48767	.46891	.45016	.4314	.41264
10 10 10	.52853	.5103	.49208	.486	.47385	.45563	.4374	.41918	.40095
10 10 10 10	.47567	.45927	.44287	.4374	.42647	.41006	.39366	.37726	.36086
10 10 10 10 10	.42811	.41334	.39858	.39366	.38382	.36906	.35429	.33953	.32477

## VIII. (Continued) Decimal Equivalents to be used in Figuring Chain Discounts.

Rate %	47½	50	52½	55	57½	60	62½	65	66⅔
Net	.525	.50	.475	.45	.425	.40	.375	.35	.33333
2 ½	.51188	.4875	.46313	.43875	.41438	.39	.36563	.34125	.325
5	.49875	.475	.45125	.4275	.40375	.38	.35625	.3325	.31666
5 2 ½	.48628	.46313	.43997	.41681	.39366	.3705	.34734	.32419	.30875
5 5	.47381	.45125	.42869	.40613	.38356	.361	.33844	.31588	.30083
5 5 2 ½	.46197	.43997	.41797	.39597	.37397	.35198	.32998	.30798	.29331
7 ½	.48563	.4625	.43938	.41625	.39313	.37	.34688	.32375	.30833
7 ½ 2 ½	.47348	.45094	.42839	.40584	.3833	.36075	.3382	.31566	.30062
7 ½ 5	.46134	.43938	.41741	.39544	.37347	.3515	.32953	.30756	.29292
10	.4725	.45	.4275	.405	.3825	.36	.3375	.315	.3
10 2 ½	.46069	.43875	.41681	.39488	.37294	.351	.32906	.30713	.2925
10 5	.44888	.4275	.40613	.38475	.36338	.342	.32063	.29925	.285
10 5 2 ½	.43765	.41681	.39597	.37513	.35429	.33345	.31261	.29177	.27788
10 7 ½	.43706	.41625	.39544	.37463	.35381	.333	.31219	.29138	.2775
10 10	.42525	.405	.38475	.3645	.34425	.324	.30375	.2835	.27
10 10 5	.40399	.38475	.36551	.34628	.32704	.3078	.28856	.26933	.2565
10 10 5 2 ½	.39389	.37513	.35637	.33762	.31886	.30011	.28135	.26259	.25009
10 10 10	.38273	.3645	.34628	.32805	.30983	.2916	.27338	.25515	.243
10 10 10 10	.34445	.32805	.31165	.29525	.27884	.26244	.24604	.22964	.2187
10 10 10 10 10	.31001	.29525	.28048	.26572	.25096	.23620	.22143	.20667	.19683

Rate %	70	72½	75	77½	80	82½	85	87½	90
Net	.30	.275	.25	.225	.20	.175	.15	.125	.10
2 ½	.29225	.26813	.24375	.21938	.195	.17063	.14625	.12188	.0975
5	.285	.26125	.2375	.21375	.19	.16625	.1425	.11875	.095
5 2 ½	.27788	.25472	.23156	.20841	.18525	.16209	.13894	.11578	.09263
5 5	.27075	.24819	.22563	.20306	.1805	.15794	.13538	.11281	.09025
5 5 2 ½	.26398	.24198	.21998	.19799	.17599	.15399	.13199	.10999	.08799
7 ½	.2775	.25438	.23125	.20813	.185	.16188	.13875	.11563	.0925
7 ½ 2 ½	.27056	.24802	.22547	.20292	.18038	.15783	.13528	.11273	.09019
7 ½ 5	.26363	.24166	.21969	.19772	.17575	.15378	.13181	.10984	.08788
10	.27	.2475	.225	.2025	.18	.1575	.135	.1125	.09
10 2 ½	.26325	.24131	.21938	.19744	.1755	.15356	.13163	.10969	.08775
10 5	.2565	.23513	.21375	.19238	.171	.14963	.12825	.10688	.0855
10 5 2 ½	.25009	.22925	.20841	.18757	.16673	.14588	.12504	.1042	.08336
10 7 ½	.24975	.22894	.20813	.18731	.1665	.14569	.12488	.10406	.08325
10 10	.243	.22275	.2025	.18225	.162	.14175	.1215	.10125	.081
10 10 5	.23085	.21161	.19238	.17314	.1539	.13466	.11543	.09619	.07695
10 10 5 2 ½	.22508	.20632	.18757	.16881	.15005	.1313	.11254	.09378	.07503
10 10 10	.2187	.20048	.18225	.16403	.1458	.12758	.10935	.09113	.0729
10 10 10 10	.19683	.18043	.16403	.14762	.13122	.11482	.09842	.08201	.06561
10 10 10 10 10	.17715	.16238	.14762	.13286	.11810	.10334	.08857	.07381	.05905

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